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THE AMERICAN GAS LIGHT JOURNAL

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PUBLISHING OFFICE No. 32 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, HEATING, MECHANICAL, CHEMICAL AND GENERAL SCIENCE.

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The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[OFFICIAL NOTICE.]

Sixth Annual Meeting, Michigan Gas Association.

OFFICE OF THE SECRETARY, SAGINAW, MICH., Jan. 31, 1899.

To the Members of the Michigan Gas Association: Gentlemen—The Sixth Annual Meeting of the Michigan Gas Association will be held in Lansing, on Wednesday, the 22d, and Thursday, the 23d, of February, next. The headquarters of the Association will be at the Hotel Downey, the rates at which hotel are from $2 to $4 per day. Papers for presentation will be:

"A Desirable Increase and its Source," by Mr. S. E. Wolf.

"The Importance of Proper Boiler Settings in Water Gas Plants," by Mr. John R. Lynn.

"How we Obtain our Patrons," by Mr. A. L. Zwisler.

Contributions will also be made by Mr. B. O. Tippy and Mr. T. B. Guitteau. Respectfully, HENRY H. HYDE, Secretary.

[SPECIAL OFFICIAL NOTICE.]

Ohio Gas Light Association.

OFFICE OF THE SECRETARY, DELAWARE, O., Feb. 13, 1899.

It is my painful duty to advise the members of the Ohio Gas Light Association of the death of our honored and beloved President, Mr. B. P. Holmes, who died at Youngstown, O., Sunday morning, Feb. 12, at 5 o'clock.

The Vice-President of the Association, Mr. E. H. Jenkins, of Buffalo, N. Y., will assume the late President's responsibilities in connection with our fifteenth annual meeting, which is to be held in Springfield, O., March 15 and 16, 1899. T. C. JONES, Secretary.

[Special Editorial Correspondence.]

Twenty-ninth Annual Meeting of the New England Association of Gas Engineers.

YOUNG'S HOTEL, BOSTON, MASS., Feb. 16, 1899.

Dear JOURNAL: Winds may blow and snows may fall and temperatures may lower, but neither one nor all of such untoward conditions, atmospheric or barometric, may dull or freeze the desires of the Eastern gas men, when they are bent on talking to each other over how best they may preserve and advance their mutual interests. Low temperatures, high winds, heavy snows and such concomitants have been the fortune of those who make gas in the East for perhaps a month or more; but not snow nor wind nor frost can interfere with the New Englanders when their gaseous meeting is at hand. So it is, I'm pleased to say, the Twenty-ninth gathering of the New England gas men lacks, neither in representation nor technicality, that which belongs to those who fairly represent their trade. It might have been supposed that the deep snows of Monday last would have interfered with the attendance at the meeting, which supposition would have been correct were it not for the fact that snows are likely to soften when softer winds prevail. However, the fact is that the New Englanders turned out in good shape, and many, to say good-bye to the reunion of the New England Association that marks its passing to the fourth decade of its history. The weather conditions to-day were all right when President Fowler called the meeting to order. The gentleman from Springfield, Mass., wasted no time in calling the session to order, and, with his able aide (Secy. Prichard), the regular method was soon under way. A satisfactory report from the Secretary and Treasurer, with a report from the Directors, detailing a fair accession to membership, was followed by the address of the President, who, in his usual safe style, had a good word to say for coal gas—that is, gas made from the baking of coal in the ordinary way. Following some routine business, the first paper—that by Mr. T. H. Hintze, of Malden, Mass.—was taken up. Mr. Hintze selected as the title of his contribution, "A Paper Unnamed;" but his hearers caused themselves and him quite some talk over it. The second number discussed was an addition to the programme, and a welcome one, made by Mr. B. J. Allen, of Brookline, Mass., who spoke to the matter of "Distributing Gas at Pressures Higher than Usually Obtained with a Gasholder." The paper brought out a good discussion. Then came the election of officers which resulted thus:

President—Walter R. Addicks, Boston, Mass.
First Vice-President—W. A. Learned, Newtown, Mass.
Second Vice President—W. E. McKay, Boston, Mass.
Secretary and Treasurer—N. W. Gifford, New Bedford, Mass.
Directors—Jno. A. Coffin, Frank S. Richardson, A. J. Purinton, W. McGregor and W. G. Africa.

This result was only accomplished after the persistent refusal of Mr. Prichard to continue in the place of the Secretary and Treasurer's post. Regretting his determination to serve longer, it must be held that he did his work faithfully and well. Following the election came the paper, by Mr. J. J. Humphreys, of Worcester, Mass., who presented some "Notes on the Design and Extension of a Gas Plant." The discussion on this paper brought the morning session to a close. This afternoon the proceedings were opened by the reading of the paper, on "Correspondence Schools," handed in by Mr. A. C. Humphreys, of New York—as the author was not present, it was read by the President—which led to a good debate.

Following the reports of Committees on President's Address and Obituary, respectively, and a recurrence to the debate on the paper by Mr. J. J. Humphreys (provoked by Mr. C. H. Nettleton), the Association listened to a clever paper, on "Advertising," by Mr. H. K. Morrison, of Concord, N. H. Then followed the paper by Mr. F. C. Shelton, of Philadelphia, on "Considerations Affecting the Choice of Location of a Gas Works." Secretary-elect Gifford gave some "Notes on the Use of Superheated Steam for Burning Carbon from Retorts," which raised a good discussion. Then Mr. W. E. McKay said some things about "Steam," that were more than pertinent. The debate on Mr. McKay's paper brought the proceedings of the first day to a close. The attendance is excellent; the feeling over the trade outlook is good, and this evening the usual banquet will be held.—S."

FRIDAY, Feb. 17, 1899.

Dear JOURNAL: Plenty of warmth and much slush cause misery to pedestrians in the Hub to-day. The banquet last night was a complete success, with over fourscore good men and true participating in its pleasures. Captain White was in particularly good form. The regular order to-day was begun by the reading of a "short topic" regarding "Enrichers," contributed by Mr. E. H. York, of Portland, Me. The second number was a "short topic," by Mr. J. A. Waters, of Stamford, Conn., whose presentation of certain "Possibilities" in the gas business led to a rousing discussion. Mr. F. C. Sherman, of New Haven, then gave a verbal story over "Tar Burning," which also was the prelude to a useful debate. The Question Box was then opened and its contents studied, after which a paper, by Mr. R. W. Polk, of Providence, detailing a "Beginner's Experiments in Studying the Operation of a Water Gas Apparatus," was considered. This paper was a very interesting one. An adjournment was then declared; and at this time (noon) everyone is getting ready to visit the Everett works of the New England Gas and Coke Company. The meeting was a successful one in every sense.—S.

[OFFICIAL REPORT—REVISED BY THE SECRETARY.]

PROCEEDINGS, TWENTY-NINTH ANNUAL MEETING, NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

HELD IN YOUNG'S HOTEL, BOSTON, MASS., FEB. 16 AND 17, 1899.

FIRST DAY—FEB. 16—MORNING SESSION.

The twenty-ninth annnual meeting of the New England Association of Gas Engineers was called to order, at 10:30 A.M., Feb. 16, by the President, Mr. S. J. Fowler, of Springfield, Mass. The Secretary (Mr. C. F. Prichard, of Lynn, Mass.) recorded the proceedings. On motion, the records of the last meeting, as printed in the AMERICAN GAS LIGHT JOURNAL, were approved. The Secretary read a number of letters from persons invited to be present at the meeting, in which the writers expressed their regret over their inability to attend the sessions.

REPORT OF THE TREASURER.

Treasurer Prichard then presented his annual report, which showed receipts for the year amounting to $701, expenditures of $673.98, and a working balance of $187.82. The permanent fund amounts to $500. The report having been accepted and filed, the following

ELECTIONS TO MEMBERSHIP

were made in the usual way:

Active.

Bledsoe, J. H., Laconia, N. H. Eccles, A. D., Ware, Mass.
Danber, Wm., Norwalk, Conn. Lucey, F. J., Natick, Mass.
Miller, Carroll, Fall River, Mass.

Associate.

Barnes, A. M., Cambridge, Mass. Norton, A. E., Boston, Mass.
Scranton, G. H., Derby, Conn.

Messrs. C. D. Lamson, C. H. Nettleton and W. A. Wood, having been appointed a Committee on Nomination of Officers for the ensuing year, President Fowler read the following

INAUGURAL ADDRESS.

Members of the New England Association of Gas Engineers: Another year is passed, and we are now assembled again to take part in the meeting looked forward to by some of us with anxiety, and by others—I hope the larger number—with expectation of profit and pleasure. The gathering of so many representatives of such a large interest should always be of benefit, even if there were no special subjects brought up for consideration. It is something to meet friends and acquaintances, and to have the right to talk "shop" to an unlimited extent. Isolated as many of us are—the only representatives in our respective localities of the engineering branch of our business—it is a delight to be able to talk on the matters nearest to our hearts with men who are not liable (figuratively) to throw the old gas meter joke in our faces; but who, on the contrary, are intently studying the same subjects on which our minds are employed, and who eagerly and gladly accept advice and suggestions. I trust the members will avail themselves to the full of the opportunities afforded them; that hearten them to return to their work with renewed zeal and vigor.

The present winter has been in many ways an unusual one. Such sudden and severe changes of temperature as we have experienced this year have made the season remarkable and have caused a most distressing amount of sickness. There are probably few of us who have not the loss of friends and acquaintances to deplore; but to our Association as a body I am happy to say that no loss has come by death. Very seldom does a year go by that we are not called upon to mourn the decease of at least one of our members. Last year, as you remember, there were five members to whom we paid our last sad tribute. I congratulate the Association that this year no fresh loss has come to it. [Since the above was written news has come of the death of one of our members—Mr. Charles F. Warren, of Manchester, N. H., died last Saturday, the 11th inst., wherefore we are not to go through the year unscathed. Mr. Warren was one of the oldest members of our Association, both in point of age and date of membership. I will appoint Messrs. George B. Neal, A. B. Slater and F. C. Sherman a committee to draft and bring in suitable resolutions regarding his connection with us.]

A review of the past year shows our industry to be in a thriving condition. All over the world there seems to be a demand for more light, and the members of our Association are reaping the advantages locally of what is a universal requirement. Ours is an industry finding its home in compactly settled districts. There may be complaints from political economists and Utopians of the disproportionate increase of urban population; but "It's an ill wind that blows no one any good." And, certainly, the gas companies are reaping an advantage from the growth of the cities and towns in New England. The cities and towns, too, with their growth are receiving from us more and more favorable and generous treatment, to the mutual advantage of both parties.

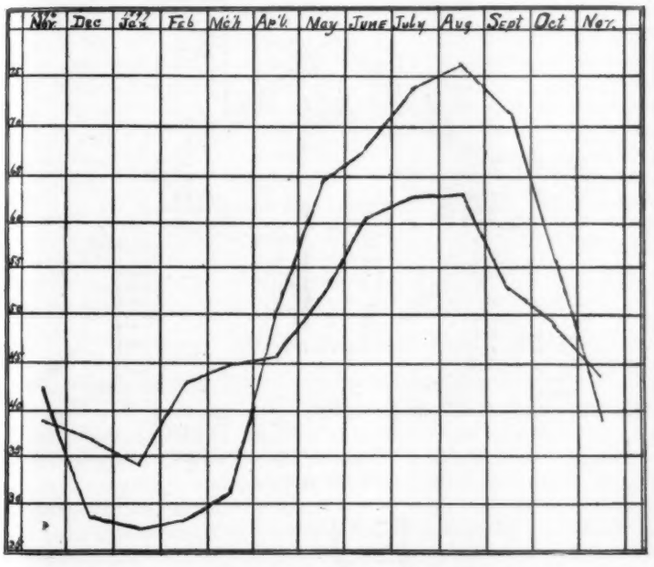
A few years ago it seemed almost as if the days of our gas industry might be numbered—as if gas were to be ground between the upper millstone of electricity and the lower one of kerosene; but gas has proved strong enough to maintain its position unharmed. It does not appear to me that, in proportion to the other means of illumination just named, gas is making great advances. Published returns of the plants supplying electricity show steady development, on the whole, and in some cases extraordinary advance in business; and my inquiries do not lead me to believe that even in the cities the oil trade is falling off at all. Consequently it appears to me that our business is simply participating in the general development of urban life. We are of course reaching farther and farther down in the strata of society for our customers, and are probably losing some customers at the top; but, provided the result be good, there is no reason for our borrowing any trouble. "There's plenty of room at the top," we all know, once you get there; but the bottom of the pyramid is the broad part, where the greatest number of individual members exist, and the more of these members we can get hold of the better it is for us.

In England the prepayment meter seems to be a great means of popularizing the use of gas among the poorer classes of the population, and it is probably the same in this country, where people are herded together in tenements, flats and rooms. In our smaller cities, where

overcrowding hardly exists, there would seem to be small room for the prepayment meter; for this machine, if it is to induce the use of gas, must be easily accessible; when more gas is needed it must be a matter of no discomfort to put in another quarter; it ought not to oblige anyone to go down cellar, in the dark (perhaps) to get more gas. Such a bother would soon cause discontent, and consequently, unless the piping be altered, the use of a prepayment meter is excluded from the isolated house. Then, too, it is hardly possible that the use of gas should ever become as popular, the whole year round, for cooking in America as in England, on account of the great differences in climate.

Gas cooking stoves, speaking broadly, are for use in summer only, except in buildings where warmth and hot water are supplied from a central point. The gas cooking stove is expected to do nothing but cooking, and is not adapted to any other purpose. The kitchen cannot in our climate be kept comfortable unless heated by some other means. In England, however, there is so little variation of temperature the year round that warmth in addition to that derived from the gas cooking stove is not absolutely necessary.

I have here a diagram giving the average monthly temperatures in Leicester, England, and Springfield, Mass, in which the green[1] line represents the English, and the red[2] the American temperature. Please



observe that for the year under consideration the highest average monthly temperature at Leicester was about 63°, and the lowest about 34°, while at Springfield the highest point was 76° and the lowest 27°. Now, where the average temperature of the warmest month is but 63°, a kitchen isn't too hot for the use of a coal stove; and at the same time a winter temperature of 34° isn't so low that a gas fire wouldn't be able to make a room comfortable—especially since habit and the greater humidity of the atmosphere make a temperature of 63° or 64° in a living room comfortable in England, while it would be unendurably chilly here.

All this goes to show that the circumstances governing the use of gas for cooking are decidedly different in the different countries, and this reacts again on the use of prepayment meters. England is preeminently the country of great gas consumption, and I have made the preceding remarks solely to call attention to causes beyond our control—causes which have an effect on the amount of our business, and which must forever continue to do so.

As to technical advance during the past year, there seems to be little to chronicle. The incandescent gas light has more than maintained its hold in popular favor and is making its way slowly as a factor in street illumination. I confess to a feeling of disappointment that the growth of the use of gas for the above purpose has not been more rapid. An incandescent gas light is certainly to-day generally the best and cheapest form of illumination, and that this form should not be in common use on our streets is much to be regretted. To a small extent this may be the fault of the gas companies, who may not have been prepared to submit to local authorities proper proposals; largely it is the fault of the local authorities themselves, due to the manner in which their lighting contracts are made; but mostly, I am afraid, the fault must be laid at the doors of the company which claims to hold the base patents on the incandescent mantle, and to the subordinate companies which have concessions from the original one. This is, however, a subject on which I feel too strongly to wish to dilate on it. Many of you have had your own experiences and will be able to amplify my remarks.

1. The low line. 2. The high line.

But the principle of the incandescent gas burner is with us, and the utilization of it is occupying many minds. Most of us can remember it in such a form that the light given was hardly more than that from a common flat-flame burner, and the endurance of the mantle extremely slight. You know to what point we have progressed to-day in common use. There seems to be no reason why progress should not proceed farther along the same lines, so that gas should be able to satisfy the demand for a blinding light, such as that given by the electric arc, and for any intervening intensity.

I have seen an incandescent light burning less than 10 feet per hour, which is stronger than the average of electric arc lights, and very much less expensive if it were not for the destructibility of the mantle. We may reasonably suppose that that drawback will soon be overcome, as have so many others. Excuse me if I do not linger on this subject. I see the long faces of those interested in electric plants, and I refrain from further remarks from sympathy and compassion.

The acetylene industry, which burst on us with such brilliancy a few years ago, has pursued the even tenor of its way. The light is so clear and bright, so satisfactory, that the difficulties in the way of its introduction must be very great to hinder its use in many places. The production of carbide seems to be increasing, therefore the use of acetylene must be growing; but it is all without sensible influence on our own industry. A few small places are lighted by acetylene, but only enongh to make them seem to be a fair number of experiments to test the practicability of the system. For certain special uses, such as car lighting, acetylene is beginning to be employed, but as a general illuminant its presence is not felt at all.

To-morrow we expect to visit the plant of the New England Gas and Coke Company, there to see the greatest experiment of to-day in the carbonization of coal and the utilization of the products thereby obtained. We, as suppliers of gas, are so accustomed to adjust in our own minds the relative value of those products that it strikes us with wonder that anyone should contemplate using the gas resulting from the carbonization to heat the coal rather than the coke. You will see retorts and settings in the operation of which it is planned to save *all* the coke and only half (or less) of the gas, instead of following our practice of saving *all* the gas and only two-thirds of the coke. This may seem to some conservative minds like spending a dollar to save a dime, but the thing will be tried under intelligent and responsible auspices, and if the plan can succeed anywhere it should here. This part of the country is habituated to the use of anthracite coal as a domestic fuel. I have no question that, given our climate, it is the most desirable article for that purpose. But as the mines become deeper and difficulties accumulate among the operating companies, the production and supply of anthracite become more expensive. We have seen within the last 15 years the expulsion of hard coal (except of very small sizes) from power plants, and the substitution therefor of bituminous coal, on account of its lower price and greater steam producing capacity. I most fervently hope that the same substitution may not take place as a domestic fuel, for I should be extremely sorry to see the air of our cities darkened by a cloud of smoke from every house chimney. But I question whether it can be long before our frugal New England people find out that there is a certain economy in the use of soft coal—before our merchants here put stoves on the market fit to use the other fuel. But here steps in the new retort oven process, and promises to supply a domestic fuel, little less valuable and agreeable to handle than the anthracite, and at a lower price. It may be the salvation of our clear skies; and, therefore, let us bid the new experiment welcome. Let us examine the plant thoroughly, carefully, and above all, sympathetically, knowing that its success will mean to us a broadening of our horizon, the taking on of new responsibilities, and an increase of prominence in our positions. When we become not only the largest purveyors of light, but also the largest purveyors of domestic fuel, then, indeed, our hands will be full.

The presence in the market of anthracite has, in these Eastern States, always had a depressing influence on the sale of gas house coke in large quantities. Formerly it could be sold in a limited way, and at prices which returned a fair percentage on the price of the coal carbonized. To-day many are complaining of the lack of a good market for coke, but I question very much whether a sale mightn't easily be made if the seller would content himself if his coke brought him the

same percentage of the price of his gas coal which used to satisfy him. I find that the percentage of the "cost of coal received from residual products" has on the average nearly doubled in Massachusetts, according to the reports of the Board of Gas and Electric Light Commissioners since those reports were first instituted. I don't know that the price of any of our residuals has risen during this time, consequently, the difference in percentage must arise from one of two causes—either we have more residuals to sell, or we are selling at the price of years ago, in spite of the drop in the price of gas coal. I am inclined to believe that, taking the State of Massachusetts as a whole, both these factors enter into the problem; that, on account of deep furnaces, we are in general getting more coke per ton to sell, and we are trying not to reduce the price of coke, knowing how easy it is to drop the prices of our commodities to the public and how difficult to raise them. Many of our members are relieved from all trouble about the coke market by the possession of an electric plant, where coke can be used for steam raising; but I very much doubt whether it is not policy to try to force the sale of our gas coke for domestic fuel and to buy soft coal for use under the boilers. In our own case there is a margin of profit in this course of action, amounting to nearly 25 cents per ton of coal carbonized; but, of course, local conditions must govern the decision.

From the above you will notice that I speak as one accustomed to make coal gas, and to consider the various possibilities of that process. Water gas has had such powerful and persuasive influences to promote its introduction and growth that coal gas ought to have a word said in its favor once in a while to keep the balance even.

The year 1898 was for us a very disturbed one politically, owing to the war, but the successful issue seemed to give an impulse to general business, which found especial expression in the growth of the production of both coal and iron. Last year we were able to buy cast iron pipe at an unprecedentedly low rate, and wrought iron and steel in proportion. This year there would seem to be a rise in prices of all iron of every class, so that improvements and extensions in our works and mains are likely to become expensive for us. When one remembers that, between 1887 and 1897, the main mileage of the Gas Companies of Massachusetts increased by more than 65 per cent., one can understand what an amount of money has been invested in mains, and how a rise in price of pipe will affect the growth of the companies. It will be hard to be so liberal in extensions as we have been in the past, and probably the rise in cost will check many a project for new machinery and holders, awaiting the time when the production of iron shall once more exceed the demand—when it will be the policy of the makers to force goods on to the market, to keep the furnaces and shops in motion. A boom in business doesn't always mean increased earnings for everybody.

In closing, a few words to the members—words addressed to you before, perhaps, but always in place. Our Association has always maintained a good rank among the fraternity. It has on its rolls many of the best gas engineers in the country, of already established reputation, and many more who are growing up to fill high and responsible positions. It should be the care and the duty of each and every one to help to keep our Association at the head of all the local organizations, and to that end each one should be willing to do his best by offering something for the good of the meetings—some incident of the preceding year, from which information and profit may be derived. Let me recommend for the advantage of my successor that each one should bear his duty to the Association in mind during this year, and be prepared to *offer* to the President of the Association a paper, or at least a "Short Topic." It is now, as you all know, a hard matter for the officers to get together the proper material to offer to you, but if you will all pull together, and if each will contribute his share, if no one will hold aloof, not only will the officers of the Association be relieved, but each one will have greater enjoyment of the meetings, in the consciousness of having done his share toward a success.

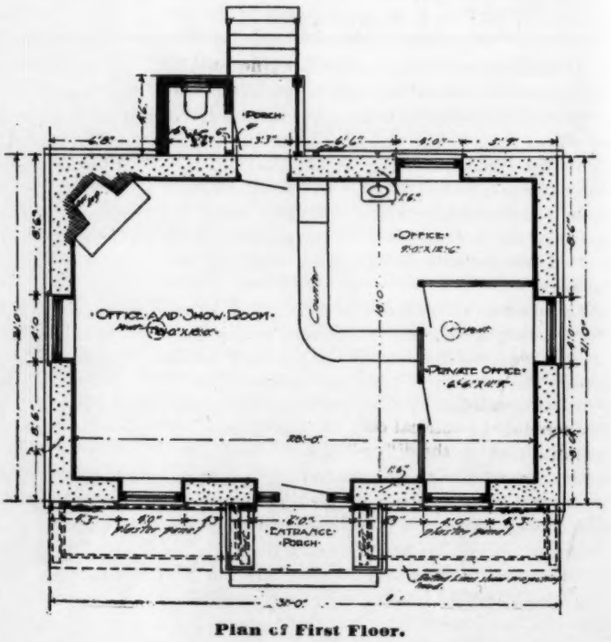
[To be Continued.]

A Model Office for a Suburban Gas Company.

We present herewith the plan, and front and end elevations, of a most attractive office structure, which has just been completed for the Jenkintown and Cheltenham Gas Company, of Wyncote, Pa. The building is eminently typical of the modern, clean-cut suburban gas company, the business affairs of which it will house. The Jenkintown Company is to operate in one of the many high grade residence communities adjacent to Philadelphia; and its owners decided that the premises to which the customers would come should not be one whit less attractive than the nearby homes of those self-same customers.

Front Elevation.

Side Elevation.



Plan of First Floor.

To that end, a one story, colonial design of structure was decided upon, and that such design lends itself pre-eminently to the purpose in view is well shown by the drawings.

The building measures inside 18 feet by 28 feet, the interior forming one large room. In one corner is partitioned off a private office, just sufficient for the Superintendent's desk, a small table and a visitor's

chair. Adjoining is another inclosure, formed by the customary counter, wherein the bookkeeper holds sway, when not engaged on the outside of barrier selling a gas stove or other useful gas burner. The stove show space is about 14 feet by 18 feet—quite sufficient for a line of samples. The stock is kept in the works' storehouse. In one corner is a brick fireplace, duly fitted with a gas log. At another point a wash basin is provided, while in the rear, wisely outside, yet only a step away, is a retiring room. A ceiling is provided, making the premises warmer in winter and cooler in summer than if the roof framing were left in view, as well as affording storage space, in the inclosure betwixt ceiling and roof, for boxes of account books, vouchers, JOURNALS, etc.

A door in the rear leads to the works. A private telephone also connects with the works to the office. The front door and overhanging portico are completely colonial in treatment, harmonizing entirely with the deep roof, the plain, white blinds, the outside seats, the small window lights, the heavy chimney and chimney pot, etc.

The interior walls are wainscoted, 4 feet high, and rough plastered and tinted above. Externally, a little rough plaster is seen in the eaves and over the gabled windows, and the rough stone is heavily pointed in the joints. All will in time be softened by the growth of ivy vines, planted at either end. The roof is well shingled and stained.

This building is purposed for an office and gas appliance salesroom only; it is not a meter house. The works' meter is safely located in the rear of the manufacturing plant. Placed as this office is, in the middle of a plot, where, in the proper season, a glowing clump of red cannas will bloom, flanked by lesser flaring flowers, bounded in front by a cedar post and honeysuckle fence, and a gravel path between two rows of old-fashioned box hedge leading to it, the Jenkintown Company's head quarters should be well worth a visit. In fact, the Company seems to have aimed to provide a park that will minimize the terrors of the fair residents of the district who hate a gas works in their midst, and who fear to pay their gas bills.

The structure complete as outlined cost less than $1,500. The design thereof is from the board of Messrs. Keen & Mead, of Philadelphia, after the suggestions of the officers of the Cheltenham Company.

Electrolysis Manifestations, Jersey City, N. J.

Engineering Record remarks that some time ago Mr. C. A. Van Keuren, Chief Engineer of the Board of Street and Water Commissioners of Jersey City, became convinced that electrolysis was injuring some of the water mains in that city. After making several investigations he secured authority to retain Mr. A. A. Knudson, whose studies of wandering electricity in New York were reviewed in these columns on November 5, 1898. The latter engineer recently submitted a report on the subject, which is reprinted through the the courtesy of Mr. Van Keuren, as showing an unusual manifestation of this annoying phenomenon.

Belleville avenue is a street in the country over a portion of which the trolley cars of the Union Traction Company run on their way from Rutherford to Arlington, N. J. There are no fire hydrants on this road, as is the case in cities, in connection with the pipes, which are convenient for making electrical tests. Therefore excavations were necessary. Two of them were made, one at the intersection of Belleville and Kearney avenues, near the reservoir, and the other at Elm street. The distance between the two excavations was about 2,000 feet on the Belleville road, for which distance the pipes and tracks occupy the street. A test was also made at a gate on pipe No. 1, located about 300 feet from the Elm street corner. After the mains had been uncovered and electrical connections made, voltmeter readings were taken to ascertain the difference of potential between the rails and pipes. For convenience of reference these are recorded in the following table. The cement covered main we designate as No. 1, and the others, to the right, facing the reservoir, as Nos. 2 and 3:

January 5, 1899. Time, 1 to 3 P.M. Weather mild.

	Main No. 1.	Main No. 2.	Main No. 3.
Distance from nearest rail.....	2 ft. 6 in.	4 ft. 6 in.	8 ft. 2 in.
Size of main.....	36 in.	36 in.	20 in.
Year when laid.....	1873	1862	1853
Max. diameter of pipe at Kearney av., rails positive.....	5 volts.	10 volts.	12.2 volts.
Max. diameter of pipe at Elm st..	2.5 "	2 "	4.1 "
Test Jan. 10, 12:30 P.M., Elm st...	.....	.....	15 "
Max. diameter of pipe at gate, rails positive	6 volts.	.....	.....

The table shows that stray currents of electricity are passing from the rails of this road into your mains at a voltage much too high, in view of other conditions of the case to be explained later, to consider them free from the destructive action of electrolysis. The range of maximum voltage is from 5 to 10.2 volts at Kearney avenue, and from 2 to 15 volts at Elm street, this latter high reading being discovered at a second test on the 10th inst. on pipe No. 3. The rails, however, in all of these tests were positive to the mains; consequently no damage is anticipated from electrolysis to the pipes in this street, and no signs of same were found at these excavations on any of the mains. The rails, however, show evidence of electrolysis to a marked degree at both openings, but more so at Kearney avenue, where their lower sides show considerable corrosion.

It will be understood that the point where damage is caused by electrolysis is where the current leaves the metal, or, in other words, tests positive to some other metal.

For the purpose of easy reference as to position of tracks, with mains,

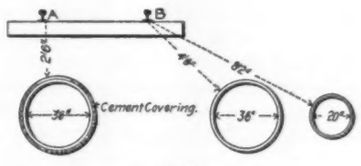


FIG. 1

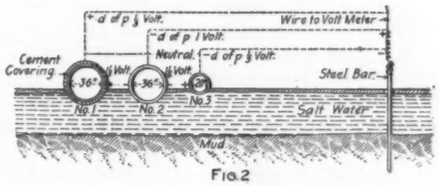


FIG. 2

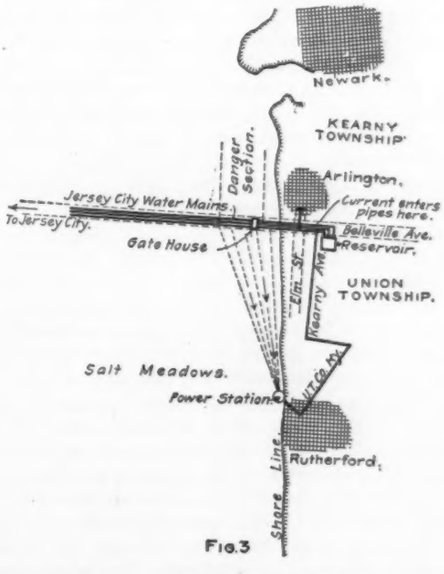


FIG. 3

distances from same, etc., we submit Figure 1, which shows the situation where the Kearney avenue excavation was made. At the Elm street corner the distances are about the same, with the exception that pipe No. 1 comes under rail *B*, instead of rail *A*, Nos. 2 and 3 further to the right and keeping about the same distance throughout.

In former experience it has been found that when a stray current passes from the rails of the road to water pipes it is very apt to find an exit at some other locality in the system in seeking another path of easy return to the dynamo. In our efforts to discover, if possible, such point of exit of the current in question we have consulted maps which show the line of the Union Traction Company's railway, the location of their power station, and the route of your water main. From a careful study of the same we came to the conclusion that the most probable point of exit in this case would be where the water mains cross the salt meadows on their way to Jersey City, for the following reasons:

1st. The power station of this road is located at Rutherford, on the border of the salt meadows.

2d. The distance in a straight line from the water mains, which the current would take at a point near the shore of this station, is shorter by about 2 miles than the route of the railway over the various roads through which it runs. This is shown by the use of a scale of miles.

3d. The salt water and mud of the marsh in which these mains are partly submerged offer a good conductor for the current to pass through them on to the aforesaid power station in a direct line. We therefore, with the assistance of your foreman, Mr. Carroll, made voltmeter tests at a point known as the gate house, about ¼ mile from the shore proper, on the morning of the 10th inst., between the hours of 10 A.M. and noon; weather very cold.

In our attempt to intercept any current which may be flowing from the pipes at this point toward Rutherford, we drove a steel bar down through the ice and water and well into the mud of the marsh. From its upper end we connected a wire and attached the distant end to the voltmeter. Electrical contact was then made to each pipe without difficulty and the voltmeter readings taken.

As the results of our tests at this point show features of scientific interest as well as information of importance, we give them in Fig. 2 and also in Fig. 3. It will be seen that the two outside mains, Nos. 1 and 3, are positive to the steel bar at a difference of potential of ½ volt in both cases, while the middle pipe, No. 2, tests 1 volt negative to the bar or marsh, the outside mains, 1 and 3, testing neutral to each other.

Tests between the mains show that both Nos. 1 and 3 are positive to No. 2 with 1½ and 1½ volts, respectively, showing the current to be leaving the two outside mains and passing into No. 2.

While these tests show a comparatively low voltage from the outside pipes to the marsh, under conditions such as being buried under soil free from alkaline solutions, or salts, such as would prevail on a country road, no particular danger from electrolysis would be feared; but as the case stands the presence of salt water, in which they lie continually, is an electrolyte which materially assists the action of electrolysis even at low voltage. Again, the case is more serious under these conditions when the higher voltage of 1½ is considered, found passing between the mains. The brick and cement coverings on pipe No. 1 would offer but little, if any, protection against electrolysis under these conditions. From these tests, therefore, that were made on the meadows, the indications are that much of this escaping current passing into your mains on Belleville avenue comes out from them on the meadows, but distributed for some distance along their length, probably for half a mile, as illustrated by Fig. 3, the arrows pointing in the direction the current takes in returning to the power station at Rutherford.

Mains Nos. 1 and 3, therefore, according to these tests and indications, would be the ones affected by electrolysis, while No. 2 would be practically free from same.

The results of this investigation show a striking analogy to a condition of stray currents found by me in a recent investigation in the vicinity of the Brooklyn Bridge entrance, New York, where it was found that railway currents passed over the structure to New York, thence up the East Side, through underground pipes, etc., and recrossed through the river to the power station at Kent avenue, the difference between this case and yours being that your water mains represent the bridge, and the salt meadows the iron piping and the East river.

It is probable that if a number of tests were made along the sides of these mains in the meadows the voltage would be found to vary, higher or lower, as the case may be; but we believe sufficient data have been discovered to determine existing conditions. The danger section, therefore, of your water mains, as we have endeavored to locate in this investigation and set forth in this report, is on the salt meadows, where the current leaves the pipes about 2 miles from where it enters, at Belleville avenue. Taking all things into consideration, therefore, the excessive escape of 10 volts maximum at Kearney avenue, and of 15 volts maximum at Elm street, and passing out of this current on the meadows through an electrolyte, such as salt earth and salt water, thereby facilitating the action of electrolysis, is a condition which, if allowed to continue, will, in my opinion, seriously shorten the life of these very important water mains.

In regard to the remedy I have consulted with the officers of the Union Traction Company with reference to making such changes that will reduce this escape of current into your mains, and they express their willingness to do whatever is necessary to obviate the trouble.

I do not think that this escape of current is due to any imperfect design of construction, as, generally speaking, the road is well built, much better than is found among the average trolley roads operating through and between small towns. It is provided with an insulated return conductor through its entire length, which many electric roads do not have. I have also seen the character of bonds used for connecting electrically the ends of the rails, and they seem to be as good as any in the market, two being used, I am told, for each rail. Notwithstanding this, there is something wrong, and the railway people appear to be anxious to discover and rectify it for their own interests as well as yours.

The most effectual method for eliminating this current escape to your mains would be a removal of the rails from this portion of the street in which the mains are located. As this, however, may be impracticable, I would suggest that the Company be allowed to make such changes to reduce the escape as they have in mind, such as putting in more frequent tap connections from their return wire to their rails (they now being over 1,000 feet apart), and examining and renewing such rail bonds, as well as cross bonds, as may be found imperfect. When this is done further tests should be made at Belleville avenue, as well as at the danger section on the meadows, to determine if the escaping currents have been checked and danger from electrolysis removed.

In referring to future tests on Belleville avenue, these can be made without further excavations, as before the holes were covered in we took the precaution to make a good connection with insulated wires to one of the mains (No. 3), which was led up to a known point on the surface. This was done at both of the excavations, and as tests have been made at both places since covering it, the readings of the voltmeter showed the wires to be intact and ready for future use.

The instrument used in making these tests was a standard Weston high and low reading voltmeter, which had not been used since being recently standardized at the Weston factory, at Newark, and consequently was in perfect order.

The Trend of Designing in Central Electric Stations.

In the course of a paper on the subject named in the heading, read before the last meeting of the Northwestern Electrical Association, the author (Mr. B. J. Arnold) remarked:

It is but little over a decade since the electrical student was told by those who were supposed to be authorities that to get a reasonable efficiency in electrical machinery high rotative speed in the moving parts was necessary. While this statement contains an element of truth, it is by no means as important as at first supposed, for our slow-speed generators and motors of to-day are more efficient than many of the high-speed machines of that time. Difficulties in the manufacture of heavy electrical machinery and lack of knowledge on the part of the designers of that time were probably the father of the idea; but, be that as it may, the result was to flood the country with electrical plants, consisting of engines, dynamos, pulleys, shafting and belts—good, bad and indifferent—thrown together in almost any manner. These, however, performed their functions remarkably well under the circumstances, and enabled the youngest branch of the engineering industry to command the brains, energy and capacity necessary to revolutionize the transportation and factory methods of our cities and make herself felt in many of the homes of our smaller cities and towns. But since Darwin's law of "the survival of the fittest" applies equally well in engineering as in natural history, the belts and pulleys are gradually becoming extinct; the engines and generators have left off their prehistoric earmarks and have grown to their responsibilities and to the possession of those elements which make them the bulwarks of electrical industries, the same as the older types of steam engines were to the factories which they drove prior to the advent of electrical transmission. To determine how far this development has gone and its probable tendency in the future is the subject assigned me by your committee to discuss to-day.

The problem which confronts the power station designer is almost invariably that of the operation of arc lamps, incandescent lamps and motors for various purposes with the greatest degree of economy and with as little expenditure in first cost of plant as possible. This is strictly true of combined lighting and power stations, which present the most difficult cases to handle. When, however, the problem is simply one of the development of electrical energy for power purposes only, such as railway work or transmission work, it becomes much simplified. Since the question of the design of a station is interlinked with and dependent upon the system of distribution adopted, we find ourselves struggling with many of the old questions and some new ones, such as the alternating arc versus the series arc and the constant potential arc;

the polyphase transmission plant versus the direct current; the advisable voltage, either alternating or direct, to adopt for central station work.

While I do not in this paper presume to settle these questions, we must necessarily form some idea of their probable solution for general cases, for otherwise we can hardly expect to speculate on "The Trend of Central Station Design." The old belted station we may consider obsolete, and come at once to the general types which have been recently installed by competent engineers, and which may be considered as embodying the latest ideas of those skilled in this class of work. In all of these stations we find certain main parts which may be considered as accepted practice, as follows:

Of course, there are many belted stations running and doing excellent service, which simply speaks well for the engineers and designers, and more especially the manufacturing companies who installed them in the earlier days, because at that time there were few engineers skilled in this branch of work except those in the employ of the manufacturers.

The points in accepted practice are, then:

Water tube boilers, capable of carrying high steam pressures. This probably will be disputed somewhat by the advocates of other types of boilers, and with some reason; but it nevertheless has become almost standard to use water tube boilers in modern central stations.

Mechanical stokers, or improved furnaces or grates.

Self-supporting brick or steel stacks, usually steel. A steel stack can be put up for considerably less money than a brick stack, and for all practical purposes it is equally as good, and can be maintained a sufficient number of years to warrant its adoption in almost every case if properly looked after.

High pressure steam piping is not duplicated, as was thought necessary by engineers eight or ten years ago—practice having proven that one single steam header can be divided so as to make a plant reliable if the engines are properly located with reference to the boilers and the header. I planned one plant in 1891 with a duplicate system of steam piping, and I firmly believed in it at that time, but have never since had occasion to use the duplicate system, and have never since installed one. I think there are few engineers in the country to day putting in plants with duplicate systems of piping, unless in buildings where it seems necessary to do it, and on account of the peculiar location of the engines with reference to the boilers. Steam piping costs excessively in a power station, and the less of it put in the better, because there is then less radiating surface to waste heat and fewer parts to keep up. The diameters of the steam headers which are being placed nowadays are somewhat decreased as compared with those installed four or five years ago.

Large Compound Condensing Steam Units. It has become accepted practice to install as large engines as are practical on account of the decreased cost per horse power and the increased economy of a large engine over a small one. They are almost invariably compound engines, where it is possible to condense, and in many cases whether it is possible to condense or not. The tendency toward triple expansion work is not as strong as it was five years ago, it having been determined that for almost all cases a compound engine will get nearly as good economy as a triple expansion engine, and in many cases just as good; requires less investment, is less costly to maintain, and the difference in economy of the triple expansion over the compound is so slight that it makes it inadvisable to install except in exceptionally large sizes. On account of the excessive diameters of the low pressure steam cylinders in large compound engines it is the practice to install triple cylinder compound engines—that is, to divide the low pressure cylinder into two smaller cylinders, the combined area of the two being equal to the area of the large cylinder of a single compound engine.

Direct Connected Generators of Large Capacity. What has been said in general regarding large steam units applies equally well to electrical generators, because the larger the size the greater is the economy of the combined unit.

To these chief features of design, which have become so generally accepted as to require little or no discussion, there may be added several features which may be justly called "tendencies" or "trends," which have not yet been universally adopted.

Under the first heading comes economizers. Economizers, as you are aware, consist of a series of vertical cast iron tubes carrying water within them, and around the outside of which the gases pass from the boilers to the smokestack. There is no doubt, in my judgment, but that there is economy in the use of an economizer, ranging from 5 to 7 or 8, and sometimes as high as 10 per cent. In order to get the benefit of an economizer, ample draught must be provided. Sometimes an economizer is installed where the draught is poor, the result being no economy and the annihilation of the draught. There is only one solution for this, and that is to increase the height of the stack or introduce mechanical draught to realize the benefits of the economizer.

Mechanical Draught. Under this head there are two types, induced draught and forced draught. Induced draught apparatus consists of a large fan or fans driven by steam engines or electric motors, and placed between the economizers and the smokestack, or, if economizers are not used, between the boiler flues and the smokestack, the object being to draw or suck the smoke from the boilers through the fan and deliver it into the stack. The advantages of either type of mechanical draught schemes are, first, a lower and less expensive stack can be used; in fact, no stack at all is required except to get the gases above the buildings in the immediate neighborhood of the property. Second, the fires can be handled under any and all conditions. We are all aware that the condition of the atmosphere changes our draught, and in case a stack is no larger than is required, there are days when it is difficult to hold steam, and it becomes necessary to put more boilers into service than would be necessary if a mechanical draught fan were used. Where the economizers can be installed in connection with induced draught an economy is always effected.

Then there is the forced draught, which consists in blowing air under the grates of the boiler and forcing it up through the fire and into the stack, which is supposed to perform the same function that the induced draught does. The objections to it are that inasmuch as it creates pressure in the firebox, the gases are liable to escape out into the room and make a distasteful fire room. Otherwise the results accomplished are practically the same as with forced draught, and it is considerably less expensive to install—and this is its chief advantage.

Cooling Devices. Under this head come cooling towers and cooling tables. In most plants in this country there are probably no facilities or natural opportunities for getting water for condensing purposes, and until recently we have thought it was advisable to continue to operate these plants non condensing. During the past two years there has been a tendency to put in these cooling towers, and when properly put in there is always an economy effected, resulting in a net saving of at least 15 per cent. in fuel. A tower consists of a series of vertical tubes or sheets, usually within a wrought iron frame, through which air is forced by blowers, driven by steam engines or electric motors, and down through which flows, or sprinkles, or is spread, the water delivered from the condensers. The water coming in contact with the air is cooled and accumulates at the bottom of the tower, and is then pumped into contact with the steam and condenses it. The same water is used over and over, so that only from 5 to 10 per cent. will have to be renewed on account of the evaporation. The 5 per cent. must be added from the city waterworks, or other outside source.

In place of the cooling tower, where real estate is cheap and available, a table can be erected, consisting of a series of boards laid gridiron shape, upon which the water is delivered by the condenser pumps and is sprinkled down through the boards, and the air from the atmosphere penetrating through underneath the shelves comes in contact with the hot water and cools it. It then forms a pool at the base of the shelves and is taken from there and pumped back in contact with the steam in the same manner as in the cooling tower. This device can be installed for the same, or less, amount than a cooling tower, and it is advisable to install it where there is sufficient real estate to place it upon, because it requires no power to cool the water, and power is required to drive the fan of a cooling tower.

Motor-driven Auxiliaries. Many of the most modern plants are equipped with electrically driven air pumps, boiler feed pumps, and cooling tower motors, if tower is used. There is a question as to whether this is the most economical thing to do or not. Some believe it to be so. Others maintain that the latent heat derived from the exhaust from the steam driven auxiliaries, if run through a surface of closed heater, more than compensates for the wasteful use of the steam by these steam pumps. I incline toward the belief that there is economy in the use of electrically driven auxiliaries, on account of the non-wasting of heat by pipe radiation, if for no other reason, because the primary objects to be obtained in a power station are to generate the steam with as little fuel as possible, lead it as directly as possible to the steam cylinders, where it is to do its work, and exhaust it into the vacuum as quickly, with as little pipe to radiate heat as possible; and electrically driven auxiliaries seem to me to accomplish this result better than any other.

We now come to what is at present known as the combination generator. It consists of a machine having two commutators and capable of generating current at two voltages. It may be direct current on each end or alternating current on one end and direct on the other;

but, in either case, it is a machine deriving its power from an external source in contradistinction to a rotary converter, which revolves itself by means of the current passing through it. These machines are coming into use for railway work, telegraphy and printing office work. They seem to be the connecting link between the alternating and direct current apparatus. A power station installed with such machines is capable of generating polyphase currents and transmitting such cur rent by means of static transformers to a long distance at a high poten tial, then running through rotary converters and delivering out on the line direct current, thus enabling us to utilize our direct current motors which are already installed. The efficiency of such a machine is from 92 to 98 per cent., dependent upon its size.

There is one type of machine whose future has not as yet been determined, and perhaps no man can at present safely foretell its future, but there seems to be a demand for it. I refer to the multi circuit arc dynamo. There is such a machine made to deliver current for four circuits of about 100 lights each, and if the series arc is to survive, this type, made to deliver current for five to ten 100-light circuits, will be the arc machine of the future, and it will revolve at the same rate of speed as our present direct-connected incandescent or alternating machines do, because we must eliminate belts. I am speaking of large stations, and, as I say, if the series arc is to survive it will be driven by large machines with slow rotative speeds. Such a machine will prob ably not have an efficiency greater than from 80 to 82 per cent., and that is what militates against it, the same as the low efficiency of the present series-arc machine does.

Having thus enumerated somewhat briefly the principal factors which are working to shape the design of the future central station, I will briefly describe two types of stations which have lately been built, and seem to represent the latest practice.

1. The composite station, consisting of two or more independent steam units carrying upon the engine shaft a direct-connected generator suitable for giving light or power, and in addition a pulley or flywheel carrying a belt or rope driving on to a common shaft to which the other engines similarly drive, and from which small direct-current arc machines, or other old style machines, derive their power. This type is admirably adapted for utilizing out of-date machinery. There have been several large plants of this style installed in the last two or three years by a leading firm of engineers, and the stations, I understand, are giving excellent satisfaction. I refer particularly to the stations at Toledo and Washington, and the solutions of the particular conditions of those cases seem happy ones, because they enable the owners of the properties to utilize all of their old machinery until such times as it may be deemed advisable to change.

2. Consists of independent engines carrying direct connected generators. This type is admirably adapted for plants where but one kind of current is delivered, but in case two kinds are required it becomes necessary to have a generator of each type upon each engine shaft, or have double the number of reserve units that would be required if but one kind of current were desired from the plant. In either case the investment in plant becomes excessive to insure reliability. Two or more kinds of current can be obtained from such a plant by making all of the generating units alike, so far as kind of current is concerned, and driving secondary generators by means of motors running from the main generators. This means is often adopted in rebuilding old plants for driving the old series arc machines, being directly coupled to an alternating or direct current motor driven from the main bus bars. While the stations I mentioned a few moments ago are good engineering, I believe this is better engineering—that is, to eliminate belts entirely—and if we have a number of different types of machines to drive, we had better produce our energy from standard machines of the same character and size, if possible; then drive the older type of high speed machine directly connected from motors, and the efficiency of the combined plant will, I believe, be better than where the belted type is used.

3. There is one other method of construction, which I will not class as accepted, but mention it as a tendency in power station design, known as the Arnold system. There have been several of the plants installed, in which the generators are carried on independent bearings, and all made available from more than one engine; but as I do not wish to take advantage of you, I will refrain from discussing the merits or demerits of this system. It is claimed by its advocates to have certain advantages.

REPRESENTATIVE ELLSBREE has introduced a resolution in the Connecticut Legislature to permit the Meriden Gas Light Company to increase its capital stock to $500,000.

The Measurement of Earthwork.

Engineering Record, commenting editorially on this subject, says: The Supreme Court of California has recently rendered an interesting decision on the measurement of earthwork, a question brought before it in a suit by A. V. Scanlan against the San Francisco & San Joaquin Railway Company to recover the large sum of $20, which he claimed was due because of the Company's refusal to make a proper allowance for shrinkage. The contract between the two parties contained the following provisions: "On embankments a percentage for shrinkage must be added to the fill and said percentage will be as specified and marked out by the engineer, but will in no case exceed 10 per cent. of height of bank. * * * Material will be measured in embankment, but no measurement will be made of the material added for shrinkage, nor payment made for same." In the Superior Court of Joaquin county Mr. Scanlan called as a witness an engineer who testified he had measured the embankment after its completion and found it to contain a certain number of cubic yards, but he did not give the data upon which his computations were based. He testified that his computations were made by measuring a certain number of cross-sections, finding the average area of these sections, and multiplying this average area by the length of the embankment. One of these computations was based entirely on his own measurements, and the other, which was much less, on the measurements made by the Company's engineer, except as to the height, which the witness filled in from his own measurements. The Court adopted neither of these computations, but fixed the amount at an intermediate figure, "for which," the Supreme Court states, "we are unable to find any basis in the evidence. We think there was no evidence before the Court by which the contents of the embankment could be ascertained. The finding depends entirely upon the accuracy of the computations made by plaintiff's engineer, since the measurements themselves were not before the Court, and it is evident that these computations were inaccurate."

Inasmuch as the Supreme Court's decision legally establishes the method which must be followed in California in measuring earthwork, unless the contract expressly provides for some other method, it is reprinted herewith in full from the *Pacific Reporter:*

"The Court takes judicial notice of the laws of nature, among which are the principles of mathematics. The science of mensuration, which must control in this case, is a branch of pure mathematics, with which the Court is presumed to be acquainted. By the rules of mensuration, the contents of an irregular prismoidal body, such as a railway embankment, is ascertained by dividing it by vertical planes at every change of contour of the underlying ground into a series of prismoids, and computing the contents of each of these prismoids by adding together its two end areas and four times its middle area, dividing this sum by six, and multiplying the quotient by the length of the prismoid. The product will be the actual contents of the prismoid. See Enc. Brit. (9th Ed.) art. 'Mensuration.' This method was not employed by the witness. His method was an approximation, which assumes that the middle area of a prismoid is equal to half the sum of its end areas. This is true only in the case of a prism, or in a prismoid consisting of the frustum of a regular pyramid. This approximation, it is true, will give results correct enough for practical purposes in very uniform embankments, where there is but little difference in height. But in other cases its results are always too large, and it would be easy to suppose cases in which the excess would be greater than the difference between the estimates of the respective parties in this case.

"The plaintiff's computations made no allowance for the additional earth put on for shrinkage. It is true that there was some testimony tending to show that at the time of the measurement the embankment, to use the words of the respondent's brief, 'had settled or shrunk nearly, if not quite, all it would.' This testimony was entirely too indefinite to take the place of actual measurement, to which defendant was entitled under the contract. Moreover, it did not reach the point; for the amount to be added for shrinkage, under the contract, was to be determined, within certain limits, by the defendant's engineer, and within those limits his judgment was conclusive, even if the shrinkage should turn out to be less than he had allowed for.

"The plaintiff's engineer, working as he did after the embankment had been constructed, did not know the original condition of the ground, and, in order to supply that essential factor, he made certain assumptions which may or may not have been justified by the facts, but which the evidence does not show to have been so justified. We do not think, however, that any such assumptions are allowable under this contract. Since the work is to be paid for by actual measurement and the original surface of the ground is one of the necessary data for

such measurement, the builder, if not satisfied with the survey made by the company's engineer, should, before commencing work, have that survey corrected or make an accurate one for himself. A neglect to do this is equivalent to an admission of the correctness of the company's survey. The plaintiff should therefore have proved that survey, but he did not do this, and objected to the proof of it offered by the defendant, and it was not in evidence in the case. We would suggest that upon another trial of the case each side should put in evidence the measurements upon which any computation offered by it is founded, unless such proof is waived by the other side. If the measurements are before the Court, errors in computation can be corrected. Our conclusion upon this point renders it unnecessary to notice the other points named. The judgment and order appealed from are reversed, and the case remanded for a new trial."

The Spontaneous Ignition of Charcoal.

Engineering says that the whole subject of spontaneous combustion, whether in connection with coal cargoes in ships, cotton waste in weaving mills, etc., has long attracted attention, though there is still a good deal of mystery which remains to be cleared up with regard to the conditions underlying these phenomena. At the present time we only propose to concern ourselves with wood charcoal, a substance of rather peculiar physical properties. Not the least of these properties is its capacity for absorbing gases in varying amounts, and a French experimenter found, many years ago, that finely ground charcoal packed in a barrel attained a temperature of 75° C., after 15 hours, and ignited after 20 hours, the result, no doubt, of absorption of oxygen. The absorptive power of wood charcoal for gases was first investigated by Soussaure, who found that at 12° C. and 724 mean atmospheric pressure, one volume of such charcoal absorbed of

Ammonia	90	volumes.
Sulphurous acid	65	"
Carbonic acid	35	"
Oxygen	9.25	"
Nitrogen	6.5	"
Hydrogen	1.5	"

Subsequent figures published by Hunter showed, indeed, some variation from the above, but this may be taken as due to the fact that charcoals are of varying porosity.

Nowhere, perhaps, have the idiosyncrasies of wood charcoal, if we may use the term, come more under close observation than in the case of gunpowder works, where the material is usually made and utilized on the spot. It is now the general custom in powder works to carbonize the wood in closed iron retorts, and when this process is judged to be at an end the contents of the retorts while still hot are raked out as quickly as possible into large cylindrical iron boxes, which are immediately covered by a lid; here the material remains until quite cool. It may be judged from this that the powder works authorities recognize the importance of the charcoal being allowed to cool in the absence of oxygen—a precaution which seems to be a very necessary one. Opinion has been divided among experts as to whether certain remarkable cases of the spontaneous ignition of charcoal were attributable to simple absorption of oxygen or to the formation of a pyrophorus from certain impurities originally present in the wood.

It is not our intention, however, to enter into theoretical considerations, but rather to point out to consumers of wood charcoal the precautions advisable to obviate, or, at any rate, to minimize the danger of spontaneous ignition. That the possibility of such an occurrence is recognized, is clear from the fact that the railway companies, or, at any rate, some of them, have a special rate from lampblack; they also say, in their traffic regulations, that wood charcoal is not to be stored in the warehouses, but must be left in an open space in the yard. We know that cases have occurred where charcoal has fired in transit on the railway, and as it has proved difficult to assign the exact cause, it is only natural that the carriers should seek to protect themselves to all reasonable extent. In one case we know of, the cause of ignition was put down to the charcoal being very imperfectly burnt, though we do not quite see in this a satisfactory explanation. Nor does the supposition that moist charcoal is exceptionally dangerous seem to be founded on fact, though this opinion is held by one railway company at least. When speaking of charcoal it must not be overlooked that it is frequently found in commerce under the name of lampblack, and it is rather an important point for carriers to know whether they are taking under their charge lampblack which is charcoal, or lampblack which is pure carbon prepared by burning the natural gas from oil wells. The term lampblack is a very elastic one in several of our trades and manufactures, and refers to products of varying physical properties, and we have found that little care has been taken by those interested in the avoidance of spontaneous combustion to distinguish between these varieties of carbon. In our experience of many years in factories where the pure carbon blacks, the vegetable blacks, and the charcoal blacks were used, the only cases of spontaneous ignition that have come under our notice have been in connection with the charcoal black, and although, of course, our experience may not tally with that of others, yet we have come to consider this last as the only black concerning which any anxiety need be felt. Not that such cases of spontaneous ignition are at all common, for they are few and far between; but still they undoubtedly have occurred, and of course there is always the possibility of their repetition. Now, as to the probable cause, investigation in each case that has come under the writer's notice has strongly tended to show that whenever spontaneous ignition has occurred, it has followed the filling of an order containing some such expression as "Please deliver at once; we are stopped for the material." Under some protest, in one or two cases the stuff which the maker recognized was not ready to be sent out, was hastily packed and delivered without having been allowed to cool thoroughly in the absence of air, as described in the case of powder works.

That it is in the rapid absorption of oxygen when cooling that the charcoal acquires its dangerous character is, we think, evident from the fact that we have not heard of a case of firing when the charcoal has been prepared carefully and kept for some time before being sent out from the works. From this statement it would certainly seem to be to the advantage of the buyer if he places his order in good time, and stipulates that the material shall remain packed for such and such a time in the manufacturers' works, where any such unwished phenomenon as spontaneous combustion will be less liable to do material damage to surrounding property than if it occurred in a factory containing, perhaps, inflammable goods. As regards the other blacks occurring in commerce as lampblack, as we have said, we have no personal evidence of their danger, as the quantity of oil they may possibly contain is very small, and the case is very different from cotton waste saturated with oil. In the case of the pure very light carbon black, danger is more likely to be present when the particles get into the air and form the explosive atmosphere not unknown in colliery roadways and flour mills, a phenomenon which is, of course, of quite a different nature from that resulting from rapid absorption of oxygen.

American Representation at the Paris Exposition of 1900.

[An address by the Hon. F. W. Peck, before the Cincinnati meeting of the National Association of Manufacturers.]

We are indeed grateful for this privilege, in the distinguished presence of the men who represent in such a marked degree the industrial life of our nation, to exploit the important work that has been committed to us by the representative of the people of this republic—the President of the United States.

We realize that in presenting before this body our thoughts regarding the relation which our country should bear towards the great forthcoming Exposition, we are addressing those upon whom above any other class of citizens of our republic rests the responsibility of making that relation creditable to our nation in the eyes of the world and valuable to the vast commercial interests which we seek to advance.

We urge your earnest co-operation in our great national trust, which shall be administered without partiality or sectionalism, and we feel assured that it will be accorded to us, not only because your business interests are involved therein, but because your patriotism, your loyalty to the good name of our common country which is at stake, will induce you to aid us in presenting our wares to the 60,000,000 of people representing 500,000,000 of the inhabitants of the earth who are awaiting the part which the United States shall take in the great international peace contest about to be waged upon the other side of the Atlantic; for it will not be France only or Europe alone that will contemplate the display of our products in 1900, but also South America, China, Japan, our neighbors of Mexico and Canada, and the people of the entire world, before whom we desire to submit our samples with the reasonable expectation that our manufacturers and producers may thereby stimulate and enhance their export trade, and at the same time represent the glorious progress of their nation.

Owing to the greatness of our country, which we were enabled to present upon a formal occasion during our recent mission in Paris, the French authorities conceded to us an increased exhibit space nearly 50

per cent. beyond the allotment which had been made, and which in the aggregate is larger than that of Germany or Great Britain. The sections of the United States will attract more visitors than those of other countries, owing to our unexampled development and present importance which have been heralded and impressed upon the peoples of other nations by our recent achievements which have made the whole world wonder and ponder. The booming of our guns in the Far East and our supremacy in the West Indies nearer home have startled all mankind, and they are now watching for our display of the arts of peace at Paris in 1900, when all nations will be keenly striving against each other for business expansion, though they meet as a world's fraternity. They ask: "What will the nation which has only recently reached across the globe—the rising giant of the new century—bring to the great feast when we sit at the table of our French host next year?" The crowds will come to see our machines, our means of transportation, our electrical displays, our agricultural resources. They will learn the varied utility of corn and our food products. They will see the displays from our mines and forests. They will know that we are not lacking in the methods of education and in genius and culture in the realm of fine arts. They will become impressed with the fact that the United States has made more progress in the nineteenth century in the development of her men, the development of thought and in achieve ments, than any other nation on the globe.

Now, gentlemen of the National Manufacturers' Association, do you fully realize the greatness of your own country in a commercial sense in its relation to other nations? Do you realize that our population is about two and one-half times that of France; that the value of the manufactured products of the United States is equal to one-third of that of the entire world; that our agricultural resources are equivalent to fully 40 per cent. of those of the whole earth; that in railway transportation our mileage is nearly 50 per cent. greater than that of all the nations of Europe; that in mining, our resources are far larger than those of all Europe; and that our gold product alone was one-third of all that of the gold of the world; that one-half of our vast copper output is exported to Europe; that we are already exporting vast quantities of manufactured iron to Great Britain and Germany; that the aggregate wealth of the United States is 410,000,000,000 francs, which is greater than that of Russia, Austria, Italy and Spain combined, more than twice that of Europe, and 25 per cent. greater than even that of Great Britain, though the last-named Kingdom enjoys more than double our foreign trade. It was such facts as these which we succeeded in impressing upon the minds of the officials of the French Republic that enabled us to secure the additional area for our exhibits. It was our country's marvelous progress and present importance that forced the concessions recently acquired.

It is foreign commerce that has made Great Britain the leading nation of the entire continent, and the internal prosperity of the United States and our marvelous facilities now existing to supply the markets of the world render correspondingly great the responsibility that rests upon the gentlemen here present, representing the manufacturers and producers of the United States, to make such a display at Paris as will aid us in promoting our exports, thus disposing of our surplus profits and maintaining and increasing the welfare of all classes that constitute the citizenship of our Republic.

We have closed a year fraught with more consequences than any other in American history, and have entered upon a period of unprecedented national expansion. Here, then, gentlemen, is a great opportunity offered by the coming event of the next year that will enable our commercial growth to keep pace with our geographical expansion.

Having now referred to the commercial benefits and the patriotic duty involved in the earnest interest and co-operation of our industrial people in the relation that the United States will bear to this exposition of 1900, I will speak briefly of the importance of another most important element that must enter into our successful participation in that undertaking, and I take this opportunity to ask for your potential aid and influence in securing such additional appropriation by the Congress of the United States as is needed in order to achieve the results which every patriotic citizen of our country desires.

The original appropriation was made last June, when we were emerging from a struggle with a foreign foe, and when the allotment of space, which was then regarded as final, was far less than the present aggregate. Now that peace has been established and the Commissioner-General appointed under that act has been able during his recent mission abroad to secure a large increase of area for our exhibits, besides sites for certain buildings which must be erected in order to maintain our national honor, and in order to stand on at least a uniform basis with other great nations, it is manifest that an additional sum will be needed in order that our part in the great event may be worthy of the American Republic. A few comparisons with other nations in this regard may interest you. Germany has about 150,000 square feet of space, and has already appropriated $1,250,000. Austria has secured 110,000 square feet of space and appropriated $550,000; Hungary, 110,000 square feet and contributed $630,000; Italy, 120,000 square feet, and appropriated $600,000; Japan, 50,000 square feet, appropriated $625,000. The great United States of America has secured 220,000 square feet, besides a large area at Vincennes, to provide for which we are now limited to $650,000; or, in other words, other great nations have provided a sum for their exhibits averaging nearly three times as much per square foot as has the United States, and most of these countries are upon the very borders of France, while we have an ocean expanse of 3,000 miles to cross, and a great continent lying between the Atlantic and Pacific from which to collect and select exhibits involving a large corps of assistants and heavy traveling expenses. I submit, therefore, is there any answer to this argument of comparison?

We ascertained when we reached Paris that the great nations of the earth were contemplating the eretion of national buildings as a gathering place for their people and had secured sites for the same adjoining each other upon the embankment of the Seine, and that some of them —notably Great Britain, Austria, Italy and Belgium, Holland, Turkey and Spain amongst the rest—were building these national homes for their citizens in the midst of this foreign exposition, and our United States of America—greatest of them all—was conspicuous by its absence. We appealed, we used every diplomatic means, and finally insisted; and after many weeks of delay, the French authorities crowded other nations together in the restricted area to make room for the great American Republic, which is now reaching across the globe to Oriental seas over the heads of those older nations. We have now provided for an American gateway at a special river landing to the French Exposition through our own American Building, where American citizens can find an American home, American guides, American post office, American ice water, American comfort, amidst American environment —where they can meet their American friends from Ohio and from every State of the American Republic from Maine to California.

Will this great national organization represented here to-day insist that our Congress shall include in the needed sums an amount sufficient to enable our country to have its national structure included with this group, or shall our thousands of citizens in 1900 cross the ocean to find themselves without an American home, while gazing in shame and mortification at the flags of all other nations heralding a welcome to their peoples?

Our honored President of the United States in his recent annual message to Congress has recommended an increased appropriation. This was prepared before the present allotment of space was known and without the knowledge of the demands upon us for construction of a national building or annexes for our exhibits. I take the liberty of calling your attention to that portion of his message to Congress, which reads as follows: "In my judgment the recommendation of the Commissioner-General will call for your early consideration, especially as regards an increase of the appropriation, so that not only may the assigned space be fully taken up by the best possible exhibitor in every class, but the preparation and installation must be on so perfect a scale as to rank among the first in that unparalleled competition of artistic and inventive production, and thus counterbalance the disadvantages with which we start as compared with other countries, whose appropriations are on a more generous scale and whose preparations are in a state of much greater forwardness than our own. Where our artists have the admitted capacity to excel, where our inventive genius has initiated many of the grandest discoveries of these later days of the century, and where the native resources of our land are as limitless as they are valuable to supply the world's demands, it is our province, as it should be our earnest care, to lead in the march of human progress and not rest content with any secondary place. Moreover, if this be due to ourselves, it is no less due to the great French nation, whose guests we become and which has in so many ways testified its wishes and hope that our participation shall befit the place the two peoples have won in the field of universal development."

Will not the gentlemen of this great organization of manufacturers stand by us and lend their powerful assistance in demanding of the United States Congress the sum that is absolutely essential in order that we may maintain our pledges to the French nation, which we were obliged to make in order to secure the concessions made; and also in order that we may for the first time in our history be represented at a foreign exposition in a manner that will bring joy and prosperity to those who represent the business interests of the nation, and above all

in a manner that shall fix the eyes of the world in wonder, enhance our patriotism, and call forth our gratitude to the Almighty that our agricultural and commercial greatness makes possible such a display?

The American Republic has in 100 years enriched the history of the world beyond all other nations. Our people have builded a vast monument in the highway of progress during the 19th century; and now as we approach the close of that century and pass into a new era, how grand it is that the great event of 1900 should furnish the opportunity to crown that monument in the brilliant metropolis upon the other side of the Atlantic in the presence of all the peoples of the earth, who will stand in admiration, applaud our greatness and recognize our destiny. A nation's character, a nation's industry and a nation's thrift represent the power that lifts this crown to cap our monument of a century's progress.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

MR. ROBERT B. TABER, writing to the JOURNAL from Cambridge, Mass., under date of the 7th inst., says: German figures translated into American,

$$\frac{847{,}536 \times 180}{1{,}765.7} = 80{,}000 \text{ people.}$$

Mr. Frederick Egner, in the issue of the JOURNAL for the 6th inst., has prepared a translation, with comments, on Herr Terheast's paper in the *Journal für Gasbeleuchtung*, but neglects to translate the figures by adapting them to American units. It is interesting to note the difference, since it applies to the results of different methods and results in Germany and America. His proposition, which is the equation stated above, is that a certain Westphalian series of 60 coke ovens has a surplus of 847,536 cubic feet of gas per day, and by calculation is enough for a population of a community of 80,000 people, assuming that the maximum supply multiplied by 180 equals the total output, and that 1,765.7 cubic feet is the average amount of gas supplied each inhabitant. Of course, Mr. Egner has merely transferred the figures from Mr. Terheast's admirable paper, and this criticism has no other object than to find the American equivalent figures. Whatever may be the surplus of gas in the Westphalian ovens charged with foreign coals, the amount stated must be taken for granted, and what weight should be given this figure as applied to American coals it is useless to discuss, for no data are given. The fact is, however, plain, that of the gas only 20 per cent. is saved, and from the comparative value of coal and gas mentioned—viz., 3,531 feet equal 192.9 pounds coal—the gas must have a heat unit value little better than a high grade producer gas until enriched with the "oils remaining after the benzole has been taken off." The figure does not agree with the proportion hitherto estimated, being much lower, nor does the gas compare in estimated candle power. It is probable a difference in the quality of the coals is responsible for the variation. Much interest, perhaps more curious than valuable, attaches to the multiplier in the equation—viz., 180—which is given to represent the figure which divides the maximum day's output into the annual consumption. This figure, estimated by the reports of the Board of Gas and Electric Light Commissioners of Massachusetts, is quite different, being more nearly 160 for the entire State, and in Boston 218, and in other towns 150 to 220, varying in part with the residential towns. But the next figure to consider has a more direct practical bearing in an attempt to give the average annual consumption of gas to inhabitants in the various countries. The figure given is 1,735 7 feet, which differs from the usual estimate, that of 200 towns, of 10,000 to 20,000 people, each person will use 1,000 feet of gas per year. A more accurate figure can be obtained from the sources mentioned above, so far as Massachusetts is concerned, since the 71 companies in 67 towns send out on an average 2,330 cubic feet per capita, although there are electric light stations in nearly all of them, and reach, in some cases, 3,250 cubic feet. This variation may mean a more extended use of gas and more vigorous methods of introduction than among the companies here quoted; but it is certain that the average American of Massachusetts uses more gas by 33 per cent. than his German cousin, therefore, the equation as given by Mr. Egner becomes

$$\frac{847{,}536 \times 156}{230} = 56{,}703$$

a variation of 30 per cent. from the original dictum, and quite enough to be noticeable, affecting to this extent the computations of the value of the coke oven process and the size of the necessary apparatus for a given community.

THE United Gas Improvement Company has been awarded the contract to build the gas works for the Fostoria (Ohio) City Heat and Light Company, this Company having recently effected a consolidation of the lighting interests in the city. The equipment will consist of a setting of standard Lowe water gas apparatus, of a daily capacity of about 250,000 cubic feet, with the necessary purifiers, station meter, exhauster, Connelly automatic street main governor, storage oil tanks and storage gasholder. Everything will be thoroughly modern, and when completed the works will be a model one.

AT the annual meeting of the Bellingham Bay (Wash.) Gas Company the following officers were elected: Directors, E. S. McCord, E. Bartlett Webster, J. B. Dawson, Norman Tucker, and W. S. Wharton; President, E. S. McCord; Vice President, E. Bartlett Webster; Secretary, J. B. Dawson; Treasurer, Norman Tucker; Superintendent, W. S. Wharton.

IN our issue for the 6th inst. we reported that certain named officers had been elected to manage the affairs of the Northampton Gas Light Company for the ensuing year. Had we said that the named officers were to direct the affairs of the Northampton Electric Light Company we would have been right. There is no connection between the specified Companies.

THE Ravenna (Ohio) Gas and Electric Light Company is adding an incandescent electric system to its plant.

A PETITION to incorporate the Cable Gas Company to operate in New Milford, is being considered by the Connecticut Legislature.

MR. J. A. P. CRISFIELD, who has supervised the plant of the Mutual Gas Light Company of Savannah, Ga., and with great success, has been appointed Designing Engineer to the United Gas Improvement Company, with headquarters in the Company's home offices, Philadelphia.

C. D. GIBBONS and others, of Cleveland, Ohio, are said to be anxious to establish an opposition gas works in Warren, Ohio. Their application for a governing ordinance is being considered by the authorities. Warren has neither need nor room for another gas plant.

AT the annual meeting of the Chattanooga (Tenn.) Gas Light Company the following officers were elected: Directors, T. G. Montague, J. A. Caldwell, H. Clay Evans, T. H. Payne, S. B. Strang, William Helme and W. Clark; President, J. A. Caldwell; Secretary and Treasurer, I. S. Post; Superintendent, James Forbes.

MR. BURKHALTER has introduced into the Alabama Legislature a bill authorizing the Birmingham authorities to buy and own gas works to be operated on municipal account, and providing for a bond issue to make such purchase.

MR. GEORGE S. MOYER, SR., for many years Treasurer of the Schuylkill Haven (Pa.) Gas and Water Company, died at his home in Roxborough, Pa., the afternoon of the 7th inst. Deceased was in his 63d year.

MESSRS. BARTLETT, HAYWARD & CO. are under contract to construct a storage holder for the Peoples Gas Light and Coke Company, of Chicago, the rated capacity of which is 5,000,000 cubic feet.

WE are also told that the Ogden Gas Light Company, of Chicago, proposes to "bargain" for a new holder up to retaining 2,500,000 cubic feet.

AT the annual meeting of the Port Jervis (N. Y.) Gas Company the Directors chosen were: George P. Westcott, Geo. F. West, Henry E. Duncan, L. E. Goldsmith and C. E. Cuddeback.

A PETITION is before the Connecticut Legislature which has for its object the incorporation of the New Canaan Gas Company.

THE Kentucky Court of Appeals has (in the case of the Louisville Gas Company against Dulaney & Alexander) finally decided that gas companies may not charge a meter rent.

THE title of the Spring City Gas Company, which supplies gas in the boroughs of Royersford and Spring City, Pa., is to be changed to that of the Twin City Gas Company.

AT the annual meeting of the Peoples Gas Light and Coke Company, of Chicago, the reports showed that at the close of 1898 the Company

had 230,292 meters in use, and that the gas stoves in service numbered 20,543. The gas output for the year was 6,114,586,380 cubic feet.

A CORRESPONDENT in Philadelphia, writing under date of the 10th inst., forwards the following: "At the annual meeting of the stockholders of the Gas Company of West Chester, Pa., the following Board of Directors was elected: Chas. Y. Audenried, Thomas P. Worrall, Henry V. Massey, D. S. Lindsay and Frank D. Massey. At a meeting of the Board of Directors, convened upon the adjournment of the stockholders' meeting, the following executive management was chosen: President, Thos. P. Worrall; Secretary and Treasurer, Henry V. Massey; Superintendent, R. Hayes Dutton. Among the reports submitted the one respecting output was especially noteworthy, in that it was shown the sendout for 1898 was 20,436,300 cubic feet—in 1892 the output was a trifle over ten million cubic feet. The stoves in use number 1,225. There are in use now 1,279 meters, as against 700 in 1892—the last mentioned year is taken as the comparing one because it was the period that marked the complete change in ownership and management of the Company. The gain in meters for the year over 1897 was 75, and the gain in stoves for the same period was 214. The Company's main system covers 14 miles of territory. The Directors declared a dividend of 75 cents per share, which is the fifth dividend paid by the new management. The Company is doing well and the goods which it is giving out are as good as any put out by any similar plant in the country—and much better than many. The patrons are being considered in a businesslike and agreeable manner, and these features are bringing increased trade. Further, there is plenty of positive evidence that the Company and the residents of the district are in good accord."

THE Citizens Gas Light and Heating Company has been incorporated by Messrs. W. D. Coons, J. M. Barr, D. T. Davis, A. J. Thomas and J. F. Axline. They propose to construct and operate a gas plant in Findlay, Ohio. The concern is capitalized in $300,000.

A CORRESPONDENT in Des Moines, Iowa, forwards the following: "Some days ago Mr. Baker, Chairman of the Light Committee of the Ottumwa (Iowa) City Council, introduced an application for a change in the ordinance granting a franchise to the Ottumwa Gas, Light, Heat and Power Company, which will carry with it a resolution that the Council submit the proposed change and extension of the Company's franchise to the people at the coming spring election for their ratification. The principal change to be made in the present franchise, as asked for by the Company, is the extension of the franchise for six years more than the life of the present ordinance. That is, the present franchise was passed as an ordinance, December 16th, 1889, and was for 30 years. Thus the franchise has 19 years yet to run, and the new Company asks that it be extended for the period of 25 years from date, adding 6 years to its life. The old franchise does not give the Company right to construct or lay mains in any additions or extensions to the city of Ottumwa, and this it wants to rectify so as to include the entire city, present and prospective. Another change asked for from the old franchise is that the clause providing that the franchise for the first 10 years shall be exclusive should be stricken out. The Company claims that under the Iowa laws a city has no right to give any Company an exclusive franchise, and it wishes the clause referring to this stricken out, as it might in some way in years to come be brought up against the franchise. When the old franchise was first given the Company was in return to buy certain property belonging to the city and to supply the city hall with free gas up to a consumption of 10,000 cubic feet per month. In place of the above clause in the franchise, the Company, besides giving the city free gas for the use of the city hall, as in the old franchise, agrees also that so long as no other Company is given similar rights it will pay into the City Treasury annually 1 per cent. of its gross receipts for gas sold during the preceding year. Another addition to the old franchise, and a very important one, is a material reduction in the price of gas to consumers which the new Company agrees to make. The regular price charged for gas is fixed in the ordinance at not over $2 per 1,000 cubic feet. The Company agrees that whenever the gas bills of consumers are paid for before the 15th of the month, following that during which the gas was used, it will make a discount of 25 per cent. on bills for lighting purposes, which practically means that it will cut the price of gas used for lighting from $2 to $1.50 per 1,000. It will further reduce the price of gas used for fuel purposes and power 33⅓ per cent., which means $1.35 per 1,000. These are sweeping changes in rates, as every consumer will easily understand. On the face of the above changes in the ordinance it would seem that the Company agrees to several sweeping reforms and conditions which have not heretofore existed in Ottumwa. In the first place, the price of gas has never been lower than $2 in this city, and the Company offers a big reduction. And the offer to give the city 1 per cent. of the gross receipts from the sales of gas is a larger bonus by far than any other Company now holding a franchise in this city pays. As the Company grows and its business increases, this amount to be paid the city will also increase, and it will mean a regular revenue to the city from a source from which it has heretofore realized nothing. It is also understood that if the Company is granted the new ordinance it will make many and material improvements in its plant, which will require the outlay of thousands of dollars. The Company first intends to make some needed improvements on its power plant, which will put that plant in condition to furnish the increased supply of gas that will follow the proposed extensions of the main system. The Company also intends pushing the use of fuel gas. The recent change in the management of the Company was made because of the failing health of the late Mr. Dwight Bannister, who considered it best for the interests of himself and his family that he should retire. The new Company is in the hands of a syndicate of young men from Chicago, who have brains, energy and capital, and the coming into Ottumwa of such men should be encouraged in every possible manner. —C."

AT the organization meeting of the New Orleans (La.) Gas Light Company's Board of Directors, the following officers were chosen: President, A. H. Sieverd; Vice-President, R. M. O'Brien; Secretary, Duncan Jones; Treasurer, F. E. Richmond.

THE Council, of Hancock, Mich., is considering a petition for a franchise for the construction and operation of a gas works at that point. Hancock is a post village of a similarly named township in Houghton County, and is about 1 mile north of Houghton, from which place it is separated by a navigable water called Portage Lake, crossed by a bridge. It is connected with Lake Superior by a ship canal, and is a terminus of the Mineral Range Railroad. It is supported mainly in a commercial sense by rich mines of copper. Population, about 3,500.

AT the annual meeting of the Gas Light Company, of Augusta, Ga, the officers chosen were: Directors, George T. Barnes, Leonard Phinizy, John R. Schneider, T. R. Wright and John M. Walton; President, Geo. T. Barnes; Secretary and Treasurer, H. B. Adam.

THE Manchester delegation in the New Hampshire Legislature recently considered the measure, introduced by Mr. Cotter, under which it was proposed to put the maximum rate for gas in Manchester at $1 per 1,000. The result of the debate was the passage of a resolution to report to the main body "that it was inexpedient to legislate."

CERTAIN citizens and taxpayers of Middletown, Conn., have petitioned the local authorities "to take under consideration the matter of the construction, purchase, lease or establishment by the city of a plant or plants for the manufacture and distribution of gas or electricity, or both, pursuant to the statutes of the State."

IT looks a reasonable prediction to say that in short time the union of the interests of the Denver (Col.) Consolidated Gas Company and those of the Denver Consolidated Electric Company will be completed.

MR. E. G. COWDERY, General Manager of the Milwaukee Gas Light Company, is to be congratulated on the completeness of the pamphlet now being distributed in that city, which has for its title "Facts Relating to the Use of Gas for Manufacturing Purposes." Its text and illustrations are convincing.

THE new holder for the Seattle (Wash.) Gas and Electric Company is completed.

THE sponsors of the proposed opposition concern for Port Huron, Mich., have dubbed it the Peoples Gas Company.

AT the annual meeting of the Syracuse (N. Y.) Gas Company the following officers were chosen: Directors, R. C. Pruyn, W. L. Elkins, Jr., Stephen Peabody, Henry Seligman, W. F. Douthirt, F. W. Barker, Jas. J. Belden, Jno. Dunfee, W. S. Andrews, Grove Warner, Wm. B. Kirk, Hamilton S. White and A. K. Hiscock; President, H. S. White; Vice-President, W. F. Douthirt; Treasurer, Stephen Peabody; Secretary, F. W. Barker; Assistant Treasurer, J. J. Farrell; General Manager, Philip Cross.

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MONDAY, FEB. 20, 1899.

Means of Renewing Oxygen in Vitiated Air.

Press despatches from Paris say that an important discovery was announced in the French Academy of Medicine, by M. Georges Jaubert, Jan. 26. He has been experimenting on how to supply air or renew oxygen in air for a man in a hermetically inclosed space like a diving bell. The discoverer's hypothesis was that 79 per cent. of the nitrogen contained in respirable air remains intact after 21 per cent. of the oxygen has been consumed, and the same nitrogen, mixed with a new supply of oxygen, becomes respirable air when the carbonic acid and the vapor produced by breathing are removed.

Jaubert found that his hypothesis was correct. The most important question was the generation of oxygen. It appears that he discovered a chemical substance, which, by contact with the atmosphere, clears the vitiated air of all impure gases produced by respiration and refurnishes automatically the requisite quantity of oxygen. The author states that 6 or 8 pounds of this substance will enable a man to live for 24 hours in a diving bell.

Natural Gas War in Indiana.

The gradual exhaustion of the Indiana natural gas field is causing a lively scramble between the rival gas companies to grab the remaining available territory, with the view of making all they can out of it while the gas lasts. Two powerful organizations are now in practical control of the output of natural gas in Indiana. One big combination, recently formed, with a capital of $60,000,000, affects about three-fourths of the gas towns of the State. Their only real rival, the Indiana Natural Gas and Oil Company, with a capital of $10,000,000, supply the Kokoma district and pipe gas to Chicago. While the trust have the larger capital, the Chicago corporation own by far the largest amount of gas producing land in the belt, having secured control early in the history of Indiana natural gas of 50,000 acres of the richest gas land in the territory, nearly all of which they still possess, excepting the farms where the gas is exhausted. These two organizations are now engaged in an active war for the control of the remaining supply.

Gas Consumption in Birmingham, England.

The London *Journal* reports that the recent gas consumption in Birmingham, especially in the few weeks preceding Christmas, has not been so large as in some former seasons. The records of the Corporation Gas Department are made up to the Thursday in every week; and during the week ended Dec. 22, the quantity of gas used was 162,853,000 cubic feet, as compared with 165,724,000 cubic feet during the week ending Dec. 23, 1897, or a decrease of about 1¾ per cent. This year, foggy or frosty weather did not contribute to increase the demand. Besides, the comparison is scarcely a fair one, because every day up to Christmas the demand for gas increases; and therefore the supply was somewhat less on the present occasion by reason of the weekly return being made up a day earlier than was the case in the previous year. In the following week, ending Dec. 29, the consumption was 130,000,000 cubic feet, or about 9,000,000 more than in the corresponding week of 1897. The extraordinary drop from 162,000,000 to 130,000,000 was occasioned, as in the previous year, by the fact that the second week included not only Christmas Day, but a Bank Holiday, when the demand would fall far short of an ordinary working day. During the half year ended Sept. 30 last, the total quantity of gas consumed showed an increase of rather more than 3 per cent. when compared with the corresponding period of the previous year; and it is believed that for the Christmas quarter there has been an increase over the corresponding period of 1897.

The Market for Gas Securities.

There was nothing of moment showing in the city gas share market this week, unless a temporary rise above 41 in Amsterdam common may be taken as momentous. It is now 39 to 40. Consolidated is steady, at 206½ to 207, which were the figures at the opening today—Friday. Mutual quotations seem to show that the ancient and honorable City Bank has other competitors for the shares. The "curb" bid 317½ freely for them this week. Other city gas stocks are steady.

Brooklyn Union is 149 bid; Peoples, of Chicago, is 113; Baltimore Consolidated is 69½. Other specialties on the list, notably Consumers, of Jersey City, and Western, of Milwaukee, are in good demand. The latter is sure to cross the par mark soon.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

Feb. 20.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$39,078,000	100	206½	207
Central Union, Bonds, 5's	3,000,000	1,000	107½	108½
Equitable Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	114	.
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	315	325
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	..	..	..
New Amsterdam Gas Co.	13,000,000	100	39	39¼
Preferred	10,000,000	100	70	71
Bonds, 5's	11,000,000	1,000	103¼	104
Northern Union, Bonds, 5's	1,250,000	1,000	94½	95½
New York and East River				
Bonds 1st 5's	3,500,000	1,000	111	113
" 1st Con. 5's	1,500,000	..	107½	108½
Richmond Co., S. I.	348,650	50	70	..
" Bonds	100,000	1,000	..	..
Standard	5,000,000	100	135	138
Preferred	5,000,000	100	150	155
Bonds, 1st Mortgage, 5's	1,500,000	1,000	112	114
Yonkers	299,65	500	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	149	149¼
" " Bonds (5's)	15 000,000	1,000	118	.
Bay State	50,000,000	50	7⅜	7½
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works	450,000	100	..	..
" 1st Mtg. 5's	450,000	1,000	..	.
Boston United Gas Co.—				
1s Series S. F. Trust	7,000,000	1,000	92	..
2d " " "	3,000,000	1,000	..	80
Buffalo City Gas Co.	5,500,000	100	16½	17½
" " Bonds, 5's	5,250,000	1,000	93	93½
Central, San Francisco	2,000,000	..	105	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Columbus	1,144,700	100	70	75
1st Mortgage	1,207,000	1,000	101	103½
Consumers, Jersey City	2,000,000	100	86	90
" Bonds	600,000	1,000	104	106
Cincinnati G. & C. Co.	8,500,000	100	201½	202
Consumers, Toronto	1,700,000	50	230	235
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Consolidated, Baltimore	11,000,000	100	67	67½
Mortgage, 6's	3,600,000	..	107	107½
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	..
Consolidated Gas Co. of N.J.	1,000,000	100	15	17
" Con. Mtg. 5's	380,000	1,000	80	82
Consolidated G. & E. Co.'s., Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co.	4,560,000	50	65	65½
" Prior Lien 5's	4,546,000	1,000	94¼	94½
Detroit Gas Co., 5's	423,000	1,000	95½	96
" Inc. 5's	31,000	100	..	..
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Fort Wayne	2,000,000	..	68	70
" Bonds	2,000,000	..	80	82
Grand Rapids Gas Lt. Co.	1,000,000	50	..	..
" 1st Mtg. 5's	1,125,000	1,000	..	..
Hartford	750,000	25	..	145
Indianapolis	2,000,000	..	100	105
" Bonds, 6's	2 650,000	..	105	106
Jackson Gas Co.	250,000	50	..	..
" 1st Mtg. 5's	250,000	1,000	..	..
Jersey City	750,000	20	210	..
Lafayette Gas Co., Ind.	1,000,000	100	68	70
Bonds	1,000,000	1,000	81	86
Louisville	2,570,000	50	106	108
Laclede, St. Louis	7,500,000	100	53	54
Preferred	2,500,000	100	95	98
Bonds	10,000,000	1,000	107½	108
Madison Gas & Elec. Co.	400,000	100	..	..
" 1st Mtg. 6's	350,000	1,000	..	..
Montreal, Canada	2,000,000	100	200	..
Newark, N. J., Gas Co.	1,000,000	..	200	220
Bonds, 6's	4,000,000	..	128	130x
New Haven	1,000,000	25	252	..
Nashville Gas Lt. Co.	1,000,000	50	110	..
Oakland, Cal.	2,000,000	..	53½	55
" Bonds	750,000	..	..	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	113	113¼
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	111½	112
2d "	2,500,000	1,000	104	105
Peoples, Jersey City	500,000	50	240	250
Rochester Gas & Elec. Co.	2,150,000	50	52	..
Preferred	2,150,000	50	106	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	10,000,000	100	88½	89
St. Paul Gas Light Co.	1,500,000	100	50	52
1st Mortgage 6's	650,000	1,000	82	85
Extension, 6's	600,000	1,000	..	..
General Mortgage, 5's	2,428,000	1,000	80	82
St. Joseph Gas Co.	1,000,000	100	..	..
" 1st Mtg. 5's	750,000	1,000	..	..
Syracuse, N. Y.	1,750,000	100	18	20
Bonds	1,612 000	1,000	85	89
Washington, D. C	2,000,000	20	260	265
First mortgage 6's	600,000	..	..	..
Western, Milwaukee	4,000,000	100	97	97¾
Bonds, 5's	3,330,500	.	106	108
Wilmington, Del.	550,000		204	206

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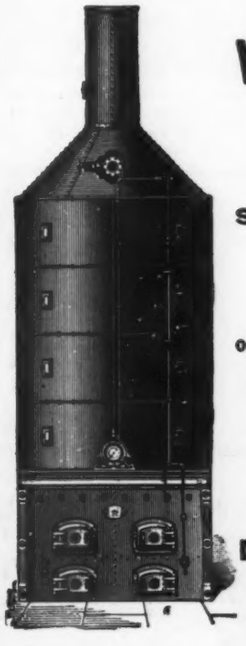

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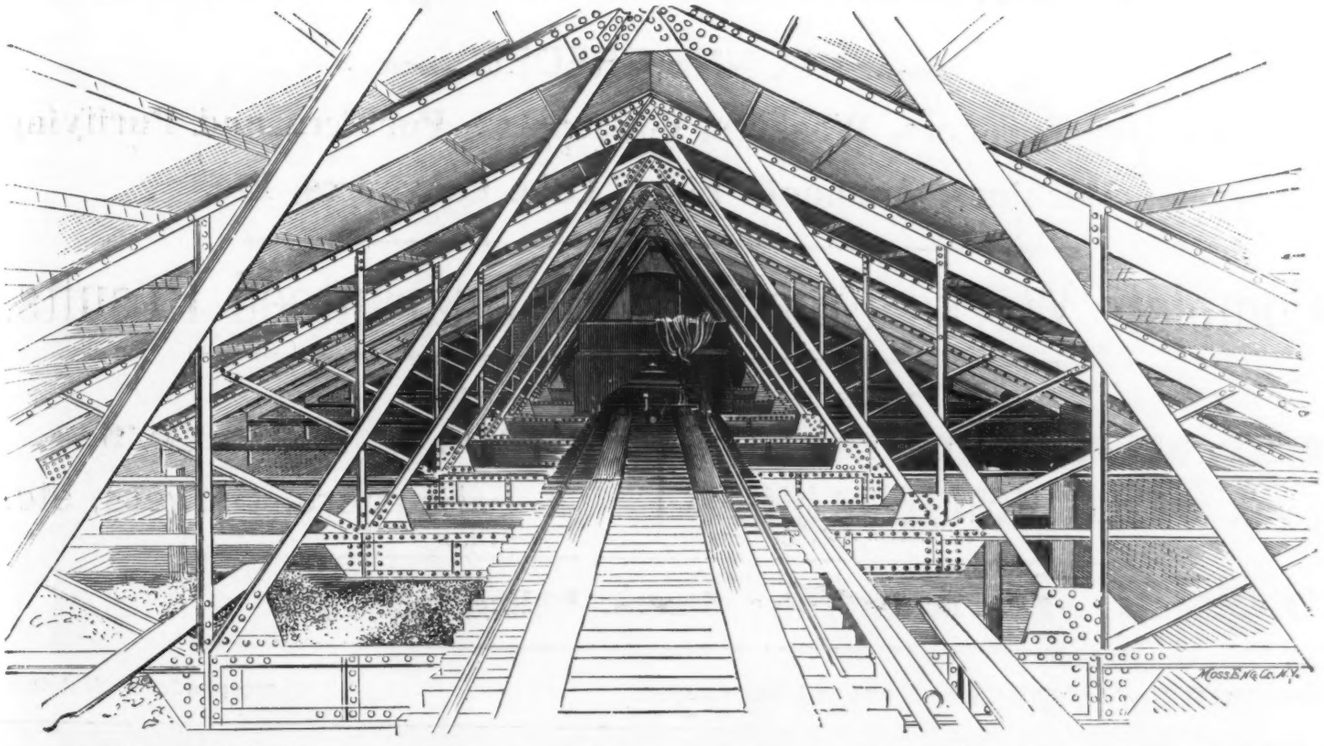

The above illustration is taken direct from a photograph, and shows the construction of an Iron Truss Roof designed and built by us to cover the Coal Sheds of the Burlington City Water Works, at Burlington, Vt. The roof is designed to carry a coal car through the center, thus allowing the coal to be distributed uniformly throughout the building. The roof is constructed entirely of iron, no woodwork being used in any part.

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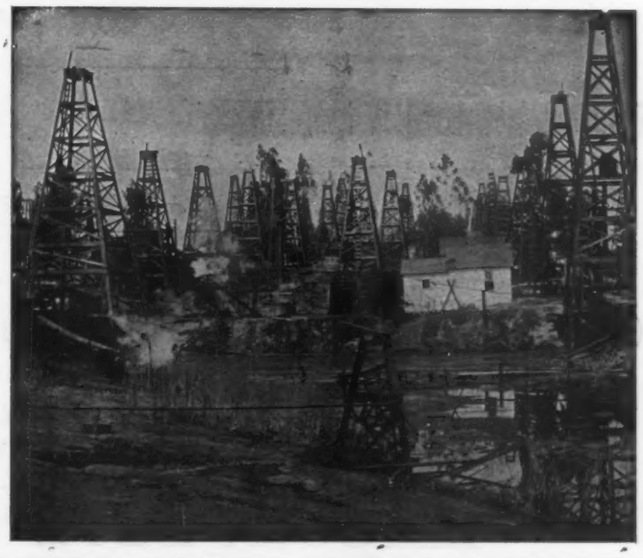
The accompanying cut shows the oil wells in the suburbs of Los Angeles from which the Companies under the NEW LOWE GAS PROCESS obtain their supply of oil.



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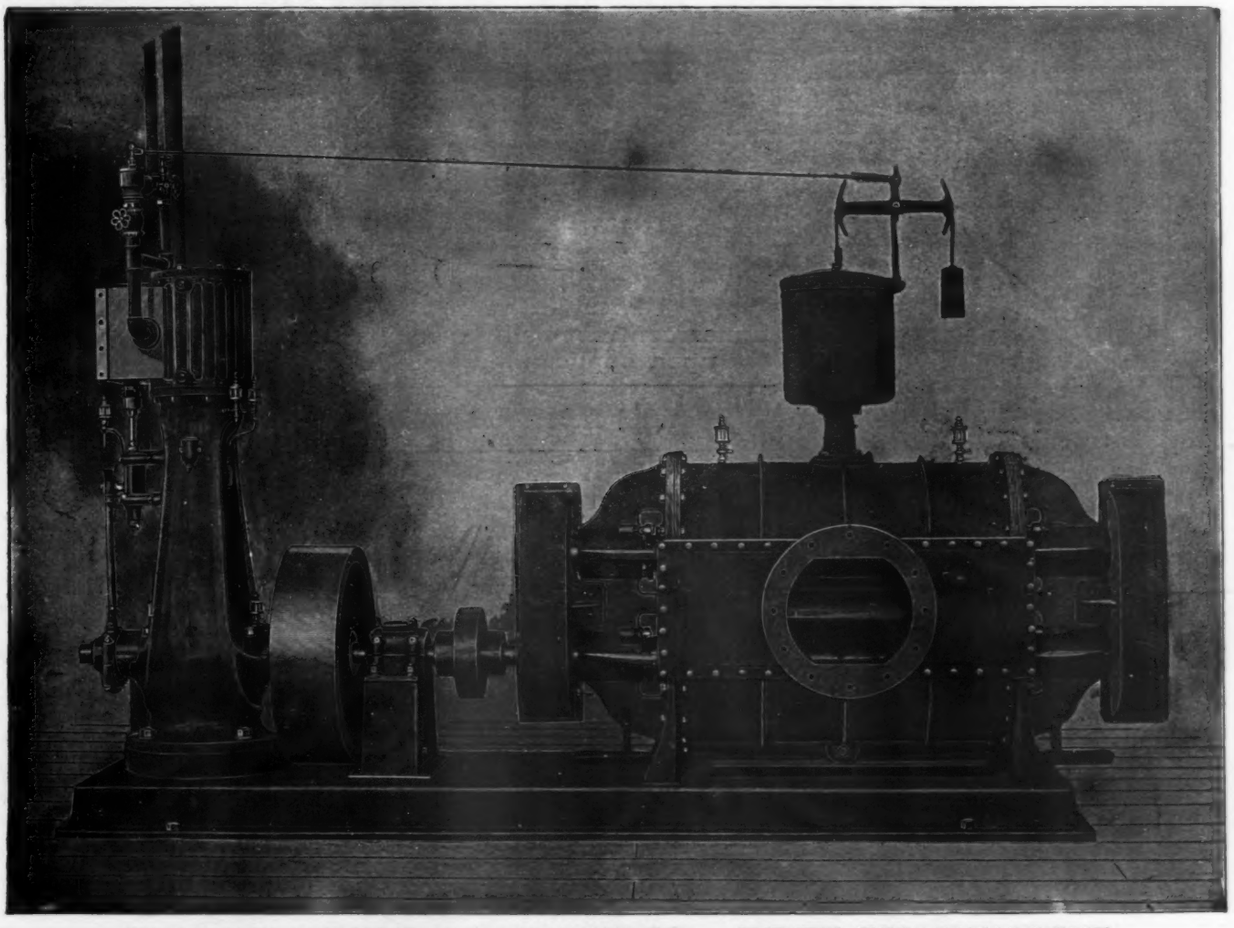

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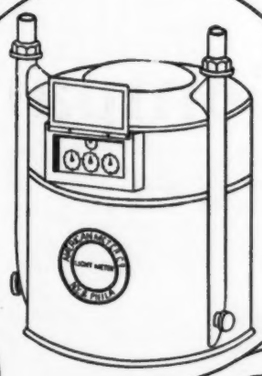
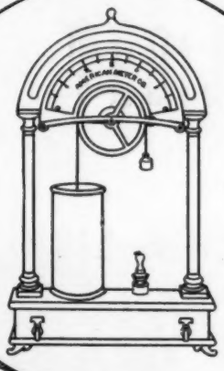
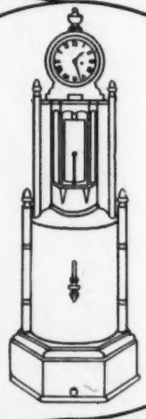
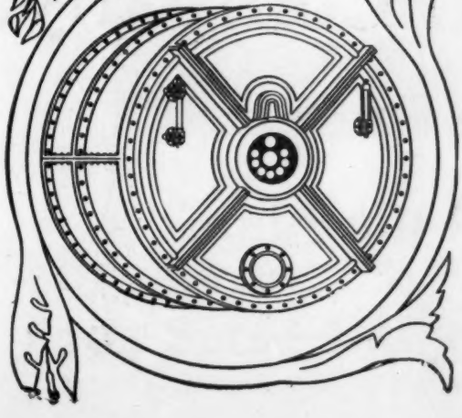








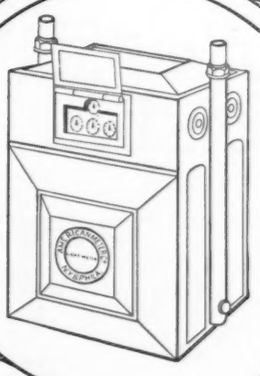
PUBLIC LIGHTING TABLE.

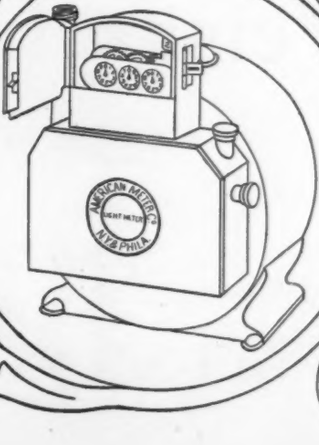
MARCH, 1899.

Day of Week.	Table No. 1. Following the Moon. Date.	Light.	Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Extinguish.
				P.M.	A.M.
Wed.	1	6.20 PM	11.20 PM	5.30	5.45
Thu.	2	6.20	12.30 AM	5.30	5.45
Fri.	3	6.20	1.30	5.30	5.45
Sat.	4	6.20 LQ	2.40	5.30	5.45
Sun.	5	6.30	3.30	5.40	5.35
Mon.	6	6.30	4.20	5.40	5.35
Tue.	7	6.30	5.10	5.40	5.35
Wed.	8	6.30	5.20	5.40	5.35
Thu.	9	6.30	5.20	5.40	5.35
Fri.	10	6.30	5.20	5.40	5.35
Sat.	11	6.30 NM	5.20	5.40	5.35
Sun.	12	6.40	5.10	5.50	5.20
Mon.	13	6.40	5.10	5.50	5.20
Tue.	14	6.40	5.10	5.50	5.20
Wed.	15	6.40	5.10	5.50	5.20
Thu.	16	11.00	5.10	5.50	5.20
Fri.	17	11.50	5.10	5.50	5.20
Sat.	18	12.40 AM	5.10	5.50	5.20
Sun.	19	1.20	5.00	6.00	5.10
Mon.	20	2.00	5.00	6.00	5.10
Tue.	21	2.30	5.00	6.00	5.10
Wed.	22	3.00	5.00	6.00	5.10
Thu.	23	3.20	5.00	6.00	5.10
Fri.	24	3.50	5.00	6.00	5.10
Sat.	25	No L.	No L.	6.00	5.10
Sun.	26	No L. FM	No L.	6.10	4.55
Mon.	27	No L.	No L.	6.10	4.55
Tue.	28	6.50 PM	9.10 PM	6.10	4.55
Wed.	29	6.50	10.20	6.10	4.55
Thu.	30	6.50	11.30	6.10	4.55
Fri.	31	6.50	12.30 AM	6.10	4.55

TOTAL HOURS LIGHTING DURING 1899.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	215.40	January	423.20
February	184.40	February	355.25
March	187.40	March	355.35
April	166.50	April	298.50
May	158.00	May	264.50
June	140.50	June	234.25
July	150.30	July	243.45
August	168.30	August	280.25
September	179.50	September	321.15
October	213.20	October	374.30
November	217.00	November	401.40
December	238.10	December	433.45
Total, yr.	2221.00	Total, yr.	3987.45





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Suits brought by the Welsbach Light Company against manufacturers of infringing lights and mantles are still pending and undetermined.

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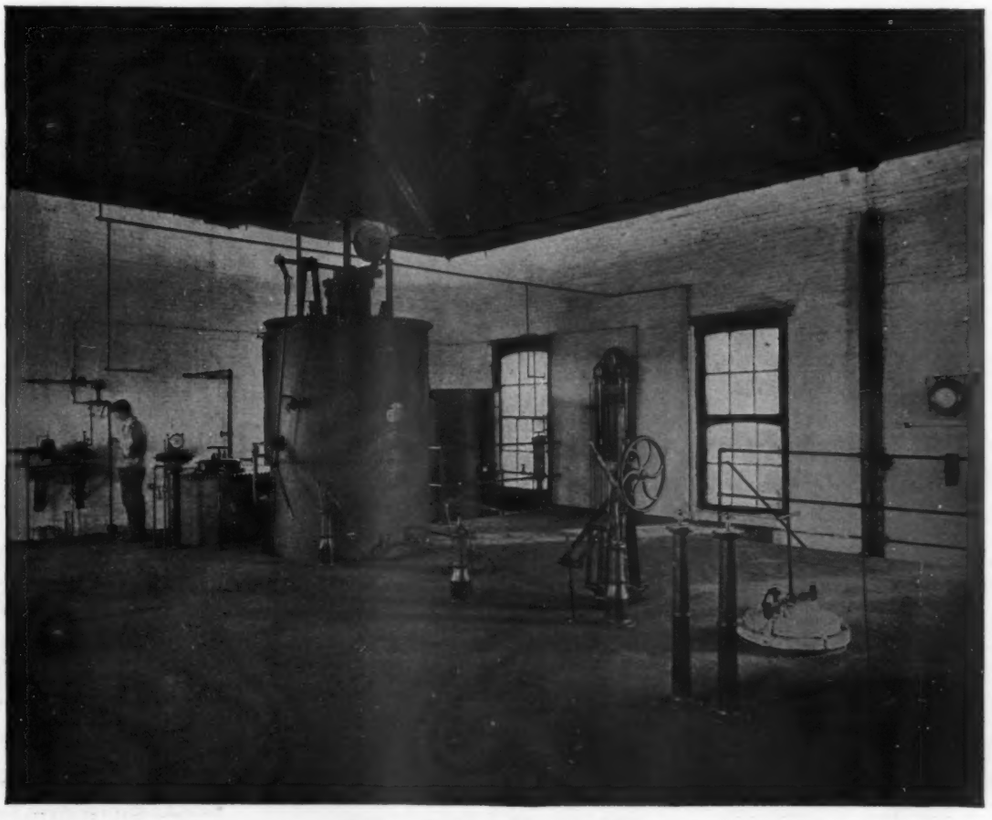

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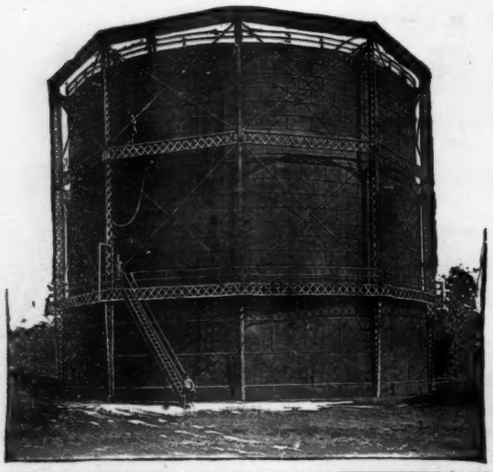

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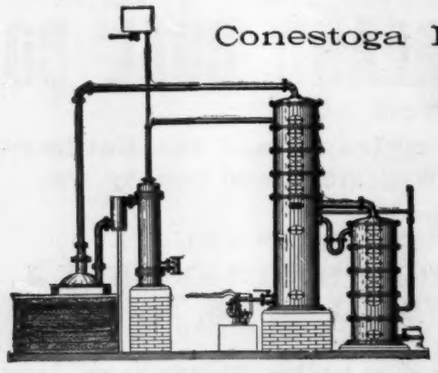

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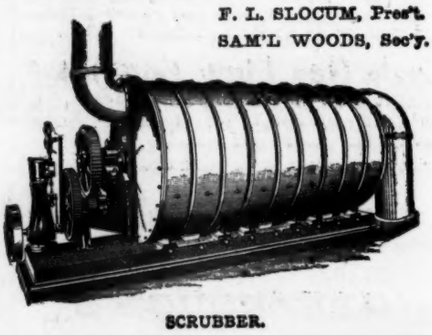

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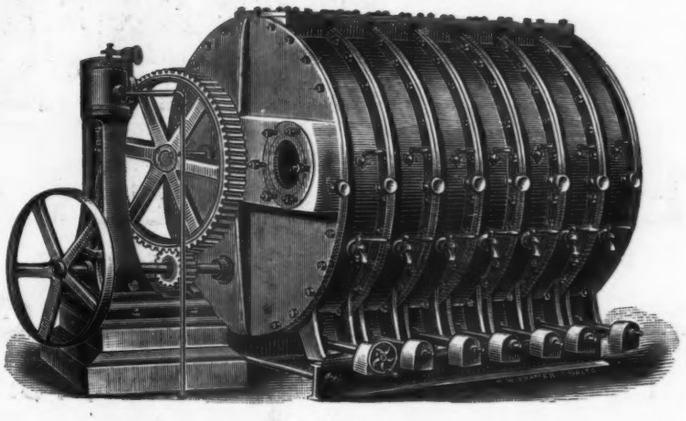

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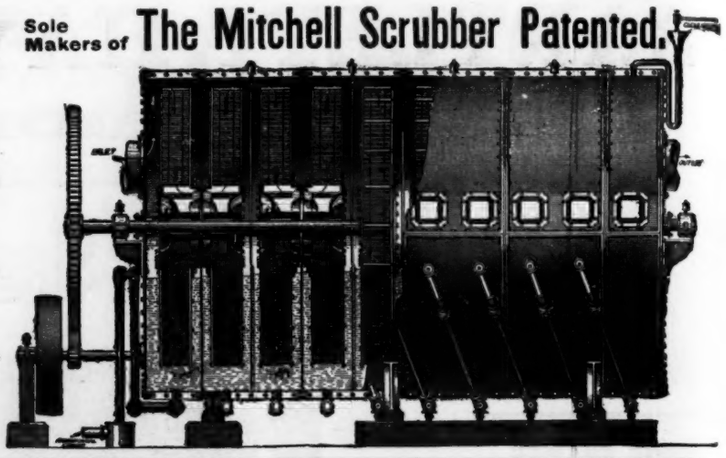

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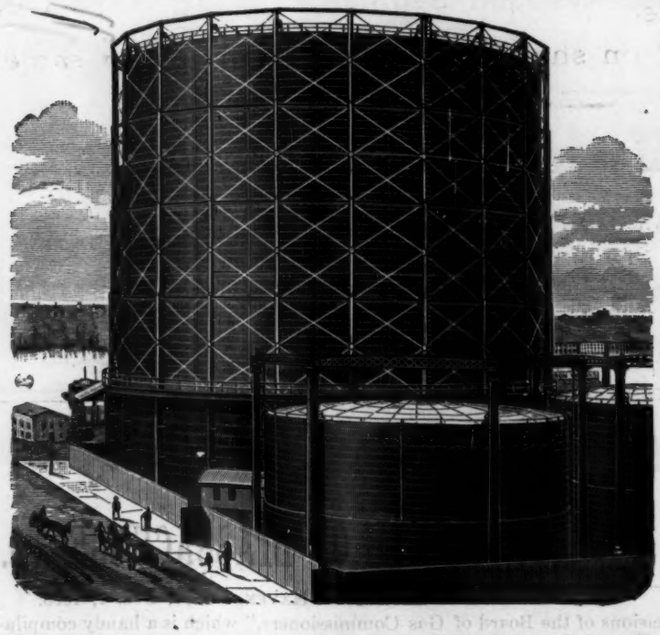

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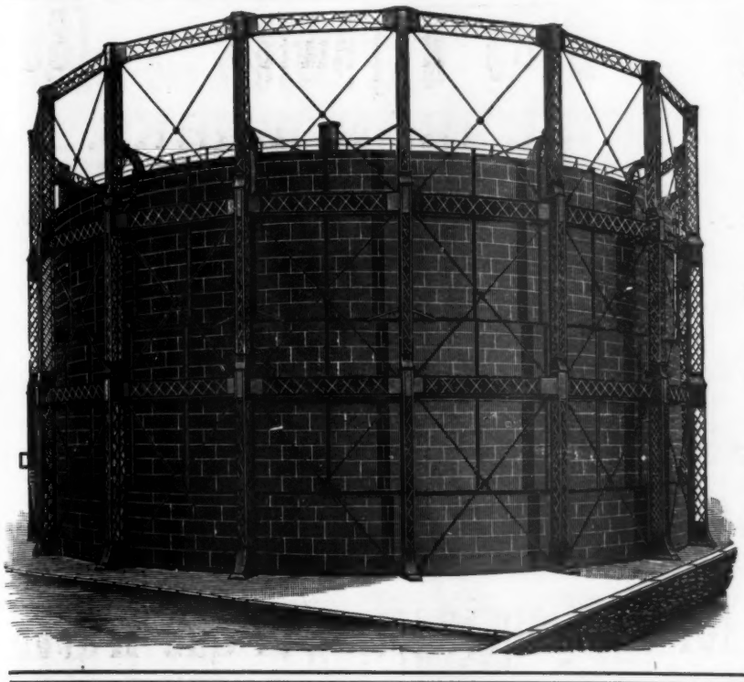

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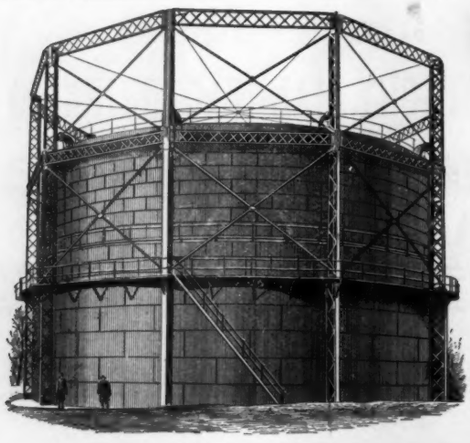

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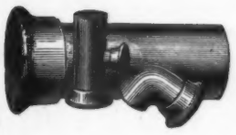
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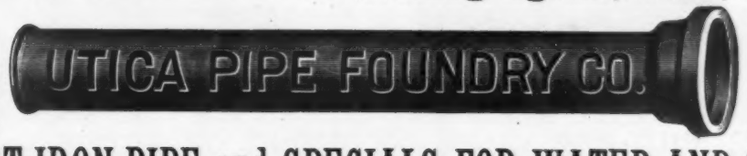

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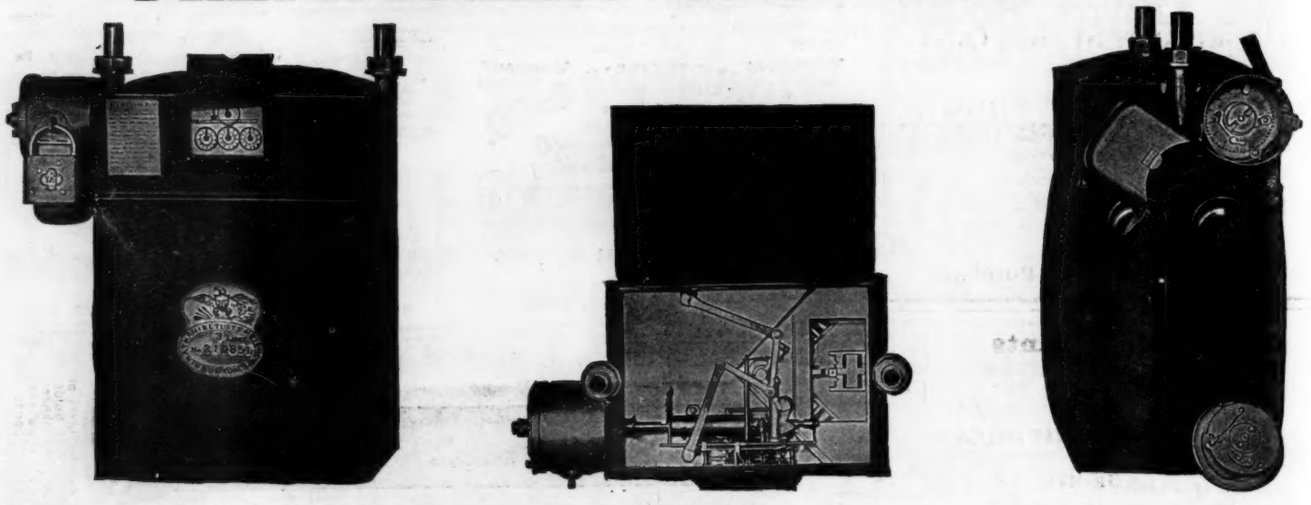

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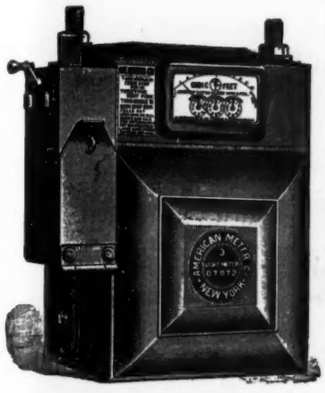

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